The CHEMIST

MAY, 1938

VOLUME XV, NO. 5

AMERICAN INSTITUTE OF CHEMISTS

ANNUAL MEETING AND MEDAL AWARD

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COMPLETE CONTROL OF PLANT GROWTH

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THE BENDING OF TWIGS

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THE CHEMIST IN INDUSTRY

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THE CONSULTING CHEMIST —
WHO, WHAT, AND WHY?

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THE REPAIR AND PRESERVATION OF
RECORDS IN THE NATIONAL ARCHIVES

The CHEMIST

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TABLE OF CONTENTS

THE AMERICAN INSTITUTE OF CHEMISTS
HOWARD S. NEIMAN, *Secretary*
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FREDERICK G. COTTRELL

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MEDAL AWARD

Dr. Frederick G. Cottrell received the medal of THE AMERICAN INSTITUTE OF CHEMISTS for "noteworthy and outstanding service to the science of chemistry or to the profession of chemist in America" at the annual banquet held on May fourteenth. Mr. Walter A. Schmidt, president, Western Precipitation Corporation, Los Angeles, California, spoke on "The Medalist", emphasizing the contributions which Dr. Cottrell has made to the profession of chemist. He also mentioned those personal qualities which have enabled Dr. Cottrell to be successful in so many chemical fields. Among these qualities, Mr. Schmidt spoke of "the knack of breaking down the barriers of routine performance and seeing the new vista". "He sees ahead into that field which most of us do not see. He has to have an army behind him to rake up the things he uncovers and to bring them in." . . . "He made people see. He could get people to do things and make them think. He had a good spirit of teamwork." Dr. Cottrell's versatility in invention was noted. "One of the most remarkable things is that a man could have his name associated with so many things . . . the metallurgical field, the petroleum industry, and the field of laboratory apparatus. Also in smelters all over the world he is known for his process of purifying gases. . . . He has the ability to see things and the courage to put them over. . . . Above all things he proved that great wealth is neither necessary for health nor for happiness. I do not think that any man in the United States had more fun in doing what he has done without thought of monetary reward. . . . He never had too much to do to help his friends. His laboratory was the center where people went who needed help on many problems." Good luck, too, played a part in Dr. Cottrell's success but "how can we introduce the element of good luck into a career?"

Dr. Cottrell was truly socially minded when he turned over his patents to the Research Corporation of New York, the profits of which were to be used to further chemical research. This company has distributed several hundred thousand dollars to worthwhile research projects.

Mr. Schmidt concluded his talk with a brief account of Dr. Cottrell's history which follows:

Frederick Gardner Cottrell

By Walter A. Schmidt

Dr. Frederick Gardner Cottrell, is an outstanding example of what a man of ability, vision and energy can accomplish in America.

Born in modest circumstances in Oakland, California, sixty-one years ago, he has, by his own energy, risen to the top of his profession, and, during his career, has accomplished much to benefit mankind.

Dr. Cottrell has many outstanding achievements to his credit in his scientific career. He is best known for his inventions which led to the development of the Cottrell electrical precipitation process. This process was first used as a means for collecting sulphuric acid fumes out of the atmosphere, to mitigate a serious nuisance, but has since been applied to an infinite number of uses throughout the chemical and metallurgical industries over the entire world. He also developed the electrical process for removing water from petroleum emulsions, and this process is used widely throughout the petroleum industry.

During the War, Dr. Cottrell's main contribution was in connection with the production of an adequate supply of helium for use in American dirigibles, which element, up to that time, had been little more than a scientific curiosity.

Dr. Cottrell, after graduating from the University of California, taught school for several years, and then continued his studies at Berlin and later at Leipzig under Professor Ostwald. He returned to the University of California to become professor of physical chemistry, a position which he held until 1911, when he entered the service of the United States Bureau of Mines. He became director of the Bureau in 1920, but not being particularly interested in administrative duties he resigned his position a year later to devote his full time to the Chemical Division of the National Research Council; but in 1922, he joined the United States Department of Agriculture to become director of the Fixed Nitrogen Research Laboratory. He held this position until he stepped out of Government service and established his own laboratory under the name of Research Associates, Inc., in which he and a few of his close friends worked on scientific problems nearest to his heart.

While Dr. Cottrell is internationally known as a chemist and metallurgist of outstanding originality and ability, he is probably best known in this country because of his unusual social outlook and general interest in social problems. The characteristic which has particularly

endeared him to his friends is his complete lack of interest in personal monetary returns and his willingness to assist others in their problems. While still a young and a poor man, he offered his patent rights on the electrical precipitation process to the Smithsonian Institution, which, not being organized to administer such patent rights, aided in the establishment of the Research Corporation of New York in 1912. This company, at that time, was viewed as an experiment in the administration of patent rights and has functioned ever since under the guidance of an outstanding Board of Directors, administering not only the original Cottrell patents, but additional patents submitted by various university professors and Government employees. All profits realized from this work are devoted to further scientific researches and in the furtherance of this important work, the corporation has distributed large sums of money to the Smithsonian Institution, various universities and other important research institutions.

Typical of a man of his type, Dr. Cottrell has been interested in almost everything worth-while and, as an amusement, has devoted much time and energy to the furtherance of the use of "Esperanto", as an auxiliary international language.

In recognition of his achievements, Dr. Cottrell has been awarded many medals, having received among others the "Perkins Medal" and the "Willard Gibbs Medal". Last year he was the recipient of the "Washington Award", in recognition of pre-eminent service in advancing human progress. His own University of California has conferred upon him its highest honor, an LL. D. degree.

At the conclusion of Mr. Schmidt's talk, Dr. Cottrell proved his amazing versatility in the fields of chemistry by reading a paper on his researches on the growth of plants. Although he is internationally known for his work in the fields of electrical precipitation and the purification of helium, and although the award of THE AMERICAN INSTITUTE OF CHEMISTS was made particularly for his service to the profession through the support of research, yet Dr. Cottrell is not satisfied with his present achievements but must continue his researches wherever he may see an opportunity for chemists to improve civilization.

Complete Control of Plant Growth

By F. G. Cottrell

I DEEPLY appreciate the honor conferred on me this evening through the beautiful symbolism of this medal and your personal attendance and good will. I only wish I could feel as confidently worthy of it as I feel grateful for the kind regard which prompted its bestowal.

In making selection of tonight's subject I was mindful that your INSTITUTE in particular takes a broad interest in the relations of chemistry and the chemist to other branches of science, and especially those suggestive of possible economic and industrial trends.

One such possible avenue of progress I happen to have contacted from a good many different angles during the past decade and that has greatly impressed me with its still unexplored possibilities is the extension and systematization of the present hothouse industry eventually into a fully mechanized and scientifically controlled factory operation, where the complexities and uncertainties of soil types and weather would be replaced by definite structural elements, as far as mechanical requirements of the plants are concerned, and by synthetic mixtures, gaseous as well as liquid, fitted progressively through research to most exactly meet the chemical requirements of each crop and stage of growth, both for the portion of the plant normally underground and for that normally in the open air. Furthermore, as every chemist will recognize, control of temperature and its possible differentiation both in time and place must be taken into account, as also problems of illumination, sanitation, and pollination. With our present knowledge both of plant physiology and this new and certainly unique brand of chemical engineering, the choice of crops giving even moderate hopes of early attractive commercial returns is doubtless sharply restricted, but it seems already pretty well demonstrated that some at least do exist and from these as seed bed for a new venture in both science and industry we have at last the legitimate starting point; and where or how far it may eventually lead is at present anybody's privilege to guess.

The term "hydroponics" is already fairly current even in popular literature to designate large scale use of chemical solutions in place of soil. This merely represents carrying a laboratory art, long standard there, into the field of actual production, therefore interesting and provocative as are the results to date, I will pass them over for the

moment as doubtless some of them at least are known to most of you from the public press.

Other possible aspects of the general subject may not be quite so familiar, especially the clear challenge they make to chemical engineering in the control of gas composition surrounding the plant and the latter's temperature throughout. By way of illustrating the potency of these forces let us take a peep into nature's own laboratory as it has operated over the ages.

Geologists tell us that the magnificent luxuriance of vegetation during the Carboniferous era, when the great deposits of coal were laid down, was probably due to the fact that the earth's atmosphere still had a higher concentration of carbon dioxide than at present.

It was partly this luxuriant growth of the plants themselves that gradually brought down the concentration, but vastly more significant was the concomitant removal of this same gas through reaction in combination with water on the rocks of the earth's crust to decompose them and help the plants build soil, thus gradually carrying down through the rivers to the lakes and the sea a constant supply of calcium and other minerals. But the sea water was given no chance to build up in calcium, for here at last the shellfish, by greedily forming from this calcium and carbon dioxide their shells of calcium carbonate, little by little built up our tremendous deposits of limestone, chalk, and marble, which in the aggregate represent vastly more carbon than all the coal and oil put together.

One may naturally ask, is this process still in progress? Is the earth's atmosphere still being depleted of its carbon dioxide, and if not, what are the tendencies that offset the steady removal above noted which are certainly still going on? This is a very fair question and one of tremendous significance. A great deal of study has been given it and very accurate measurement made over, humanly speaking, long periods of time. But what we mean by a long period of time in this sense, of course, is merely since man has had accurate methods for such measurements, which is but as a second in the lapse of geological eras, and even our most accurate measurements have not shown any appreciable change. In fact, we have an indirect proof of the present essential constancy of the carbon dioxide through the geological thermometer left us by the gradual retreat and final halt of the glacial ice sheet since the last glacial epoch.

Physicists have determined that carbon dioxide, though entirely transparent to visible light, is an excellent absorber of the infra red

or heat rays given off by only moderately warm bodies, so that it really acts within the earth's atmosphere very much as the glass does on an ordinary greenhouse as far as trapping heat is concerned. That is to say, it lets through all the energy of the visible sunlight, but after this has warmed up the surface of the earth, the heat which the latter tends to radiate back out into space is trapped by the carbon dioxide and thus serves, along with water vapor in a lesser degree, as the chief blanketing material of the atmosphere to keep our earth warm.

From their measurements the physicists are able to calculate how much the earth would tend to warm up or cool down as the amount of the carbon dioxide in its atmosphere increased or decreased. And from this they find that only a small change in this concentration would be sufficient to bring back the rigors of the glacial epoch on one side or to carry the temperature of our present tropics far up into the temperate zone. In fact, one of the prominent theories to explain the coming and going of the glacial epoch is based on the variation in the carbon dioxide content of our atmosphere. If it is at present changing either up or down, that is, if our climate is over the long range and with reference to the earth as a whole, tending to become either hotter or colder, the rate of change is too small for us to be able to detect it with our present means of measurement.

Thus you can see that even the minute amount of carbon dioxide in our atmosphere is of tremendous importance not only from its chemical significance but also from its purely physical effect on the trapping of solar energy and thus regulating the temperature of the whole planet, with all that this means for the existence of life, both animal and vegetable.

Returning once more to the question of what does maintain the balance of this carbon dioxide content, one thing that would prevent, to be sure, any sudden change in its amount is the very large quantity of carbon dioxide which is stored in the sea as carbonates and bicarbonates of the soda, potash and magnesia which are the predominant bases in sea water. But if a steady, uncompensated drain were constantly taking place on the air, the sea would also gradually, but proportionately more slowly, become impoverished, for it and the atmosphere maintain a continual equilibrium due to the currents and waves in each, always stirring them vigorously at their common boundary.

However, while the plants, at least during the sunlight hours, are

continually extracting the carbon dioxide from the atmosphere, building its carbon into their own structures as sugars, starches, cellulose, and other products, all animals, ourselves included, are just as continuously breathing in oxygen, burning up some of this same carbon that we have acquired either directly or indirectly from the eating of plants, and exhaling the carbon dioxide back into the air. Furthermore, not only do all animals work in this reverse direction to plants while under sunlight, but plants themselves while in the dark also reverse the direction of their over-all processes in sunlight and breathe like animals that is, inhaling oxygen and exhaling carbon dioxide. Furthermore, the best evidence we have seems to point to the fact that they are really doing this all the time, both in the dark and in sunshine. But in sunlight, the process of photosynthesis, as we call it (that is, the building up of sugars and other compounds from carbon dioxide and water with liberation of oxygen back to the air) is superimposed on the continuous process of respiration, and if the light is bright enough, actually overcomes it, resulting in a net reversal in the opposite direction.

But aside from the respiration of plants and animals, there are other important sources of carbon dioxide going back into the atmosphere all the time. The most evident one of these, because of our intimate personal association therewith, is the ordinary burning of fuel, be it coal, wood, oil, or gas; and whether it is burned in our home fires, in the cylinder of an automobile, on the railroad, or in factories and metallurgical works. Probably even a greater source lies in the gradual rotting and decomposition of wood and other vegetable matter scattered throughout forests and over our fields. For in all these processes of gradual consumption of organic materials carbon dioxide is being evolved and in fact pratically all the carbon of these materials is eventually returned to the air in this form. However, it is only fair to say in this case that we have in reality already counted a good deal of this under our animal and vegetable respiration because so much of these processes of rotting depends upon the action of minute organisms like the bacteria, molds, and various fungi.

It is on the whole this balance of all these forces in nature which under normal conditions keeps the concentration of carbon dioxide in the atmosphere essentially constant over the years and centuries and drives home to us once more how nicely balanced nature's forces really are.

The very fact that the rate of growth of vegetation would probably vary up and down quite sensitively with a change in the carbon dioxide

content of the air may be the automatic factor which ultimately regulates this in practice. It certainly looks as if it would be a difficult thing actually to check up on in practice. An approximate census of the unemployed is apparently hard enough to get, let alone an accurate estimate of the total rate of growth of all the forests and fields of the world. However, science is always finding new ways to answer old problems, if not directly, then through indirect causes and effects, which may be pretty accurately tied in after all with a main factor we are interested in determining, and thus give us a more trustworthy measure of the quantity wanted than if we tried to approach it directly.

What I hope the above discussion will impress afresh, if necessary, on your minds is the remarkable fixity over the ages of certain all-important atmospheric conditions determining plant growth. With this we shall presently contrast how man in his growing control of natural forces is steadily breaking down for his own advantage this age-old fixity in the conditions of nature. This it is that marks and even measures on the material side the progress of what we call civilization, quite irrespective of whether we believe all of it is for the best or not.

Man has always lived at the bottom of this great ocean of air and been absolutely dependent upon it every minute of his life, and yet it is almost the last thing of which he has become fully conscious, or secured dominion over. The force of this statement comes home to us perhaps most vividly as we think of the airplane and the tremendous revolution it has wrought, not only in material ways but in our very thinking, since those fateful days in 1903 at Kitty Hawk when the Wright Brothers first broke through the age-old superstition, may I call it, that somehow, inherently man was doomed *never* to lift himself bird-like into this great ocean and even to outdo the feathered flocks of nature in his command of flight.

But when we speak of man's conquest of the air, as we now so often do, we already have a right to include many triumphs of which we seldom think, at least collectively. And more than this, everything seems to point at present to our being just on the threshold of greater triumphs, at least in the sense of their mass effect on the total of human comfort. For even after we had accomplished the problem of flight, Mark Twain's bit of drollery, that "we all talked about the weather but none of us ever did anything about it," was still practically a truism.

Yet little by little artificial weather in the form of air conditioning is gradually creeping upon us and inevitably moving slowly but steadily from the place of a mere stunt or fad through that of a recognized

luxury to a place where we shall probably consider it ere long as constituting much the same order of a necessity as we now look upon the thoroughly hygienic water system, sewage plant, or even electric light in a modern city.

Not only is our human comfort being considered, but artificial weather is already being manufactured even to give us greater control over the flowers of the field. In Southern California where, as you have probably been told, they have only two kinds of weather, "perfect" on the one hand and "unusual" on the other, they have become so particular that elaborate scientific means have been provided for air conditioning the greenhouses in which the more exotic forms of orchids are raised. In these, not only the temperature and the humidity will be under regular control but eventually even the carbon dioxide and possibly other minor constituents of the atmosphere, as well as the amount and quality of the light and the timing of the periods of light and darkness. Already some of the most beautiful and prized species of orchids whose natural habitat is in the high reaches of the Andes in South America and which heretofore it has never been possible to raise and bring to blossom with any certainty in this country, can now be handled not only with certainty, but one of the most prized species which has heretofore required five years to raise from seed to maturity and flowering can now be brought through the whole cycle in a matter of eighteen months, and the time of flowering so controlled that the blossoms may be accurately timed to Christmas or Easter or the Fourth of July at will. Furthermore, mature flowers may be held for long periods practically in a state of equilibrium or suspended development on the plant without injury to either.

While orchids in themselves may not suggest a powerful influence on the agricultural life of the nation, this case forms an excellent illustration of how new principles and technique in science often, if not usually, have to seek their introduction and early development first in the luxury classes, where high and special values of the product can pay for this first period, fostering and developing the infant industry in its early, crude, and thus expensive stages until we gradually learn how to simplify, cheapen and prepare it for real mass production. This has been the story of many, if in fact not most industries. It is not so many years ago that metallic aluminum was almost a chemical curiosity and had to fight hard to find uses which would justify its price even in the smallest quantities

When we speak of a plant's food, we are apt to think only of that

part reaching it through the soil, for it is there alone thus far that man has learned slowly through the long ages as agriculture developed to feed the plant and give it drink through fertilizers and irrigation. As important as are the nitrogen and mineral salts which constitute the principal part of all present fertilizers, they represent only a small part by weight of the plant structure.

By far the greater portion of its building materials and finished substance is extracted from the air in the form of carbon dioxide. In normal outdoor air there is only about one part in three thousand by volume of this gas, and yet the plant manages to extract and use this for its growth. This it does through utilizing the energy of sunlight as the direct driving force in the chemical laboratory of its living cell; and the particular mechanism which it uses for the purpose we know to be closely tied up with and entirely dependent upon the green coloring matter of the leaves which we call chlorophyll, and whose composition and chemical structure we at last know fairly accurately.

The question naturally arises, would plants grow any faster or better if we were to supply them artificially with more of this carbon dioxide, that is, raise its concentration in the atmosphere. Experiments have been made on this subject and there is evidence to indicate that under certain conditions, at least, an increased carbon dioxide content of the surrounding air may considerably speed up plant growth. But the number of factors entering into the determination of plant growth as a whole is so great and their interrelationship so complicated that the effect of change in any one often depends greatly or even entirely upon the particular status of some other condition.

For example, in this very case the Smithsonian Institution in Washington has for some years past been conducting an elaborate series of investigations on the effect of different colors and different intensities of light upon the growth and general behavior of plants of widely different types; and in connection therewith has developed some marvelously sensitive instruments for measuring the slightest variation in the carbon dioxide content of the air surrounding the plant by means of delicate thermo couples on which is focused a beam of light that has first traversed a column of the air in question, and thus been subjected to the same absorption of heat rays in proportion to the carbon dioxide present as mentioned earlier in connection with the blanketing effect of carbon dioxide on the temperature of the earth's surface. So they are now able actually to measure the rate at which the plants feed from the air from minute to minute and even from second to second as

the light varies and as they artificially change such conditions as temperature, humidity and quantity of carbon dioxide present. With low intensities of light, they find there is little or nothing gained by increasing the carbon dioxide content above that in ordinary outdoor air. But with increasing light intensity upon the plant, the point is finally reached where such increase in carbon dioxide content does increase the rate of growth. And this effect becomes more pronounced as the light intensity grows stronger. With wheat plants in full noonday sun in Washington the rate of feeding and consequently growth may be increased some four fold by proportionately increasing the carbon dioxide concentration in the surrounding air.

I cite these details chiefly to indicate how easy it is for different observers to get apparently conflicting results unless they control and accurately define all the conditions, which is seldom an easy thing to do, especially when one is dealing with living material. That is why greenhouses, large or small, with completely controlled conditions of all kinds, including complete air conditioning and light control, are of such great importance in carrying out these fundamental studies of plant physiology as the ultimate basis for a thoroughly sound scientific agriculture. It is from this basis, with incidentally a certain amount of use in some special cases of high priced and more or less luxury crops, or under exceptional conditions of location and transportation, that the real importance of such equipment must probably be judged for at least some years to come. While broadly speaking, it may be true that "Science has no permanent authority in denials", still all quantitative evidence we have today seems definitely to exclude these intensive methods from economic competition with the time honored practices of agriculture for the great tonnage crops of the world's food stuffs and raw materials for industry.

There is one other aspect, however, which is worth considering, and that is as a semi-scientific hobby for recreation and leisure time. As yet this work has hardly emerged far enough from a strictly scientific laboratory stage to make it easy for the ordinary householder to set up a miniature controlled greenhouse in his back yard or even in his sitting room window. But some of the better equipped high schools and even grammar schools could well begin at least to think of something of the kind in connection with their general and popular science study courses; and if successful there, it might work naturally back into the home. The extent and real value of the model airplane hobby among the youngsters of this country is a very pertinent analogy to

consider, and possibly its technique of organization and supply might well be studied in this connection.

Another pertinent illustration is the Radio Relay League, that country-wide aggregation of enthusiastic hard working (or hard playing, if you prefer) amateurs which did so much in the early history of radio communication not only to test and demonstrate certain of its growing possibilities, but to initiate and give invaluable early training and a sense of loyalty to their growing profession to many youngsters who today occupy important posts in that same now full grown profession.

In fact a non profit organization entitled, The Plant Culture League* has recently been founded avowedly upon the same general principles, and is busy building up its contacts with plant amateurs on the one side and University and Agricultural Experiment station personnel on the other. It has already issued one pamphlet, and a more comprehensive book is reported as just coming off the press.

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* Present address: P. O. Box 1111, San Pedro, California.

The following three papers, "The Bending of Twigs", "The Chemist in Industry", and "The Consulting Chemist" were given at the Annual Meeting of THE AMERICAN INSTITUTE OF CHEMISTS, May 14, 1938.

The Bending of Twigs

by Howard W. Post, F.A.I.C.

'Tis education forms the common mind:
Just as the twig is bent the tree's inclined.

—Alexander Pope, "Moral Essays," Epistle I.

TIME was when the winning of a college degree was a matter of study and memory. It was literally possible to graduate from college with a reputable bachelor's degree at the expiration of at least four years' time and upon the accumulation of a certain number of credit hours in courses passed. No distinction was made on this point between student and student save in the awarding of such "extracurricular" honors as membership in an honor society or the addition of words of distinction to the diploma.

Then came the reaction. It was obvious to educators that the right men were not being graduated or at least were not taking their rightful places in the race for honors on graduation. In other words, success in life after graduation from college was not capable of prediction on the basis of collegiate distinctions. At the same time outsiders, employers of college graduates, were criticizing along the same line, namely, that we were not teaching our men to think. Even today that criticism is sometimes heard, but we hope with much less reason. In fact, if a careful study of the situation were to be made it would in all probability be found that the criticism is not only grossly exaggerated, but rarely justified at all. We might go even farther than this and say that present day tendencies have carried us perhaps not too far in our attempts at the development of initiative but, as many believe, far enough and that the need now among many educators is a realization that memory too has its place in the scheme of things and must not be displaced therefrom. Perhaps an example will make this point more clear.

We have long followed the custom, when explaining the intricacies of organic chemistry to our sophomores and juniors, of pointing out an occasional compound of more than usual interest and remarking that this could quite easily be prepared in the laboratory, that anyone who wished to do so would be given all possible aid and encouragement even to the extent of relief from some of the more routine matters as compensation. Only once has our offer ever been accepted. Some might say that our students lack initiative or the ability to

dare something new or to pioneer, but these are the same boys who barely a year later undertake the carrying out of a bachelor's thesis involving original laboratory work, and in practically every case do themselves more than justice.

The explanation, we feel, is quite simple. No instructor, no matter what his ability, can implant knowledge, purely descriptive in character, which will stick, save in the good old-fashioned way of telling the student. That is perhaps self-evident. True, he may tell him by word of mouth or through the medium of a book in the library to which he refers him, but he must impart the information deliberately, and this takes time. It cannot be done quickly. If a speedy transplanting of information is attempted, the bloom may appear sooner but its life is shorter. We have only to look back to our own undergraduate days to realize that some courses naturally overwhelmed us by the wealth of material that could be assimilated only by hard and diligent work, generally by what is still known as "plugging." There is no substitute if the thing which is imparted is to stick. So it is no wonder that a youngster sometimes hesitates to tackle something new when he realizes the inadequacy of his own factual knowledge along that line. We do not blame him much after all. The following year he comes back to us having passed his courses of the previous year and, we hope, at least having devoted some thought to the course material during the summer. His background is better and he knows it. His senior research problem, in the majority of cases well done, is the result.

We know of a man who graduated shortly after us who left a brilliant record as a student in the theoretical side of chemistry but not particularly so in the realm of factual knowledge. He failed utterly at his first industrial job. This was the type of job for which theoretical ability was absolutely necessary and we are by no means minimizing the importance of such ability—it, too, is absolutely necessary for the attainment of all around success. This man had no foundation in simple factual knowledge. Again a certain department of chemistry located not far from the Atlantic Ocean has as its professor of physical chemistry one who makes his boast that his knowledge of organic formulae remains at a constant minimum, almost at the absolute zero, we might add. Now we are never so foolish as to think that success in chemistry is measured solely by the number of organic formulae which a man can recite by heart, nevertheless we

do feel that if this is the case with regard to this one individual, he should at least be ashamed of it.

The point for us as industrialists and educators is that however much we may want to stress the development of skill, initiative and all that goes with these faculties, it is useless, yes ruinous, to try to build up this sort of individualism without first laying the solid foundation of factual knowledge. For how shall a man think unless he knows something to think about?

What we have just said, however, is but half the story. It is not enough to say that a boy in college must be both fed and trained. We should take stock as to the kind of food we give him.

Most of us feel that it is impossible to teach a student everything that he will need in later life. No one, I think, will disagree with us on that point. What then shall we teach? Shall we teach a lot about a little, including plant practices relating to a limited range of industries? Then what will our graduate do if he goes to work for some organization entirely foreign to that group in which he has been instructed? That situation, if allowed to develop, would place an unfair handicap on him at the very start. It is far better to teach him a few rules of the game with the expectation that his initiative will have developed during his collegiate training to the point where he will be able to adapt these rules to some specific job. So our training then is frankly theoretical even to the partial exclusion of everything pertaining to plant practices. But right here is where the industrial chemists can help us and can share our responsibility. The industrial chemists can come to our rescue, in a sense, and fill certain gaps in our curricula.

We in the colleges and universities are badly in need in the first place, of suggestions as to how best to work up a speaking acquaintance between our students and such matters as contracts between employer and employee. Now we realize full well that this is a subject which is not often discussed as such in a frank and open manner. Standing on the outside we see many individuals shrink from contact with such a problem as though it contained symbolic dynamite—maybe it does. But the INSTITUTE itself is a living witness that subjects such as this can be discussed around a friendly table by groups consisting of students, employers and employees. Contracts are often entered into in a spirit of colossal ignorance on the part of the prospective employee and believe it or not, it sometimes happens that the prospective employer finds, after affixing his name to the

bargain, that his interests are not as fully protected as he had expected. At any rate, it is a poor rule that does not work both ways and students should be told some of these things and educated to the point where they can appreciate both points of view.

In the second place, we should present to our undergraduates something on the subject of patent law, the searching and evaluation of patent literature, and the rights of chemist and employer in the matters of research and invention. Much has already been said along this line, but today we are frankly without very definite ideas as to the proper form of inclusion of these subjects into our curricula save in that of an occasional lecture given by an outside industrial chemist.

Finally, what are we going to do about giving our undergraduates actual industrial experience in plants during the summer vacations? The University of Buffalo is next year inaugurating a work-study plan under which needy students may sandwich a semester or summer session of work between two of study or *vice versa*. For various reasons this plan may never be capable of application to majors in chemistry, but on the other hand this indicates a very definite trend toward closer coöperation between industry and college today which we, quite naturally, are anxious to take advantage of to the fullest extent. In the plan just outlined two students will alternate at the same job, one working while the other is going to school. Most of us know the standard objections to any plan by which students are taken on for one summer only. In some states it is made rather expensive to hire and fire, consequently the corporation loses money when a man is taken on for one summer only. Most laboratories feel that at least one summer is necessary to teach a man the required technique. Most research laboratories feel that a much longer time is always necessary before a man begins to pay dividends on his salary. Undoubtedly all this is true, but it does not help any to say so. How can these difficulties be overcome?

A department of chemistry in a modern American university should have as its goal not alone the production of chemists by imparting knowledge, or even the training and development of ability and initiative, but rather the turning out of intelligent, cultured citizens as well, not only equipped to take their places in society but inspired so that they will want to do so. The old concept of the research chemist as a sort of medley of sage, ascetic, and concocter of mysterious alchemical smells is happily on the way out. Let us do all we can to speed its passage.

The Chemist in Industry

by Gilbert E. Seil, F.A.I.C.

THIS subject has been discussed by many men from the chemist's viewpoint, which has been interesting, but one sided. Usually the subject has not been thoroughly analyzed. An elementary analysis requires that we know five things:

What does industry expect from the chemist?

What does the chemist expect from industry?

What does industry contribute to the chemist?

What does the chemist contribute to industry?

What type of a mind must a chemist have to succeed and with his type of mind, what particular field shall he enter?

Before an effort is made to answer these questions a division of mankind, to which, of course, a chemist belongs, is advisable. There are four divisions as far as physical habits and mentality are concerned. The first group is by far the largest. It consists of those who are mentally lazy and physically lazy. The second group is not quite so large, and consists of those who are mentally lazy, but are physically active. The third group is still smaller than the second and is composed of those who are mentally active, but are lazy physically, and the fourth group is exceedingly small, consisting of those who are active both mentally and physically. Definitions of activity and laziness are comparative and depend upon the individual's training as to the value of either mental or physical activity. With equal academic and industrial experience, the success of a chemist depends upon the class in which he fits.

Since most of the previous discussions were developed from the chemist's viewpoint, this paper will avoid that attitude and first analyze the type of mind which is required in a chemist and what part his mental equipment lends in placing him in his chosen profession. His type of mind determines how much he can absorb or adsorb from his exposure to the knowledge of the faculty of his college or university.

To be an asset to the profession of chemistry, his education must found him securely and firmly in at least one language, but preferably in more, so that he can learn from the literature what others have done or tried to do, and so that he can describe clearly and concisely

in understandable language what he has done, has tried to do, or would like to do.

He must be a master of mathematical reasoning and logic, and to be a master he must study all mathematics, from arithmetic, algebra, and geometry to calculus, mechanics, theory of equations, etc. He must know natural laws. This covers chemistry and physics between which there is no longer any demarcation since chemistry includes physics and physics includes chemistry. One cannot be understood without the other. Although these are the fundamentals of pure and applied science, the student should acquaint himself by reading with subjects of applied physics, chemistry, and mathematics, such as various types of engineering, mineralogy, microscopy, etc., but if he is well founded in language, mathematics, and natural law, he is a scientist who with little other preparation is equipped to do his life's work well and earn a decent livelihood provided that he also has a vivid, visual imagination, and belongs to that class of mankind which is active both mentally and physically.

This classification of chemists, as to their mental and physical activity, their types of minds, and their academic and industrial experience, is an introduction to the answers to the five questions asked herein. Inasmuch as my viewpoint is the viewpoint of a chemist, a viewpoint on which this discussion is not founded, the reactions of various non-chemists have been obtained to ascertain what "The Chemist in Industry" means to various professional and non-professional individuals. Non-technical and technical salesmen, non-technical and technical plant engineers, patent attorneys, plant superintendents, and office men have been interviewed. The results of these interviews have been amusing and annoying, but have always been a source of education. The salesmen's views are most enlightening. The best reaction compared The Chemist in Industry to the police force of a community. Thus, as a small town has one policeman and a large city has a police department, so likewise industry has the one-chemist plant and the large plant with a chemical department. In the department, the analyst corresponds to the patrolman who follows the rules laid down for him by the chief analytical chemist whose counterpart is the traffic policeman. Traffic is possible without the traffic policeman, but it is not as safe nor as fast as with his assistance. The chemical engineer corresponds to the lieutenant of police and is the means of intercourse between the chemical department and the production department because he

knows enough chemistry to understand the chemist and enough engineering to understand the engineering department, although he is neither an expert chemist nor an expert engineer. Then the head of the experimental department, who corresponds to the captain of police, takes the processes and products of the research department and tries to make them economical. Finally we have the research director, or commissioner of police, in charge of all the departments, the executive who knows natural law, who knows organization, and who has a facility of explaining natural laws to his men so that they can understand them, and who can also explain to the non-technical board of directors the findings of his laboratory so that they can understand them and appreciate their importance. If he is a successful research director, he must be a super salesman. He must sell his board of directors a mental concept in order to obtain a budget for undertaking a new project, and after his work has been completed, he must again sell the finished development.

This is a rare analogy, but it has its faults. The police department enforces rules and laws which are man-made and can be changed from time to time. These laws may vary in accordance with interpretation, and in the police department the interpretation of the law varies in accordance with influence. In chemistry these are unchangeable natural laws which cannot be changed by any amount of argument or decision. They are fixed laws.

The plant manager's views differ as do the plants from which they come. A plant with an old scientific background in which the chemist graduates into production is a bonanza to the chemist. A plant with a rule of thumb background tries the mettle of the chemist. Here he is usually misunderstood and barely tolerated. He is a spy who tries to find the errors committed by the plant organization. He works not to maintain the standard of the plant product, or to maintain economic practice, but for his own pleasure and amusement. Where the background is scientific, the chemist is a source of new developments and new products, improvements in existing products, and the telltale for the production department for control in manufacture.

The patent attorney thinks of The Chemist in Industry as the source not only of new products but also of new processes for manufacturing old products. He looks to the chemist for the attainment of higher quality and for the development of cheaper starting materials. He also holds the chemist, fully as much as the capitalist, responsible for progress and profit.

In conclusion, the original five questions present themselves.

What does industry expect from the chemist?

Control of manufacture with regard to both the acceptance of incoming material and also the release of finished products, improvement of products, simplification and decreased costs of manufacture, new methods of manufacture, new products for manufacture, and, most important, the maintenance of his own company at least five years in advance of competition.

What does the chemist expect from industry?

A livelihood and a place to do his life's work. An opportunity to be paid for doing exactly what he wants to do (otherwise he should not be a chemist). An opportunity to do new work, and the pleasure of seeing it go into production so that he can be exalted by feeling that he has contributed to human knowledge and has benefitted mankind so that each one of us and our descendants can live better and easier.

What has industry contributed to the chemist?

Opportunity.

What has the chemist contributed to industry?

Progress and profit.

What type of a mind must a chemist have to succeed, and with his type of mind, what particular field shall he enter?

This is a large question. He must be intelligent, and, unfortunately, one cannot be taught intelligence; one must be born with it. No matter how much one learns in college or in the university, it is doubtful whether or not he becomes more intelligent. If he has not a vivid and visual imagination and a keen analytical mind, he should be content in the analytical department as a chemical laborer. If he has imagination and ambition and a desire to work unceasingly, he may try experimental or research work. If he is a good salesman and has a persuasive personality, he can aspire to the direction of development or research, or to the direction of both. However, it must be clearly borne in mind that no matter what his position, he must earn an increase in salary for a long period before he receives it. He will not get an increase in salary on future performance.

It is important that a chemist have a plan of procedure when he leaves the university. It shall include a period similar to internship during which he can learn practical applications of scientific knowledge and during which he can forget some of his so-called college ideas and come to the realization that life returns only as you give.

The Chemist in Industry is one of the favored few. He gets paid for riding his hobby and doing what he could not do at his own expense. Most people work to earn enough money so that they may buy pleasure with it. A real chemist gets paid for having fun.

Some hold that the activity of the chemist is antagnostic to Christianity which teaches fortitude in putting up with the conditions on this earth while hoping for improvement in a future heaven. The Chemist in Industry injects some of that future into the present.

The Consulting Chemist— Who, What, and Why?

by Foster Dee Snell, F.A.I.C.

IT IS always safe to start out by defining what one is going to talk about. Suppose I do that. The consulting chemist, or the consulting organization, essentially offers the services of one or many trained chemists for solution of industrial problems in the same way that the doctor of medicine hangs out his shingle to cure the ills of mankind. The similarity goes much further. The individual consultant may be a specialist in starch or metals or asphalt, or he may be a general practitioner. The larger organization may have specialists in a large number of fields and in that way parallel the service of a medical center rather than the individual doctor of medicine.

Many people visualize such an organization as doing research, then finding a customer for the product of such research, and selling the results. While there are such organizations, the majority are service organizations for rendering service to anyone who wants help.

Who?

But my subject was "Who, What and Why". Let's take them in that order. Someone is apt to ask, "Who are these consulting chemists?" There are various estimates of 25,000 to 50,000 chemists in the United States. Nearly all at some time are consultants. A nearby factory is in some trouble and asks Mr. Smith or Dr. Jones, who is known to the management, if he can help. Perhaps he works for a non-competitive firm. Perhaps he teaches in a nearby college. Perhaps he is a full time consultant. Or perhaps he is out of a job and that gives him temporary work. I know one man who spends about half his time with a company which makes smoking pipes, and the rest

on miscellaneous jobs. Another helps out a tannery occasionally and has the use of their laboratory for other work. At the other end of the scale is the organization of the late Arthur D. Little. Far from being local, such an organization is apt to be international in scope, rendering service in Mexico, Canada, Europe, and South America as well as to firms in varied parts of the United States. The development of air mail has been a powerful factor in permitting the widening of the scope of such an organization when results can be reported to St. Louis as quickly as to Buffalo.

What?

Nearly every routine analytical laboratory does occasional consulting work. What a consulting chemist is not is the old definition, "A chemist sitting on a doorstep waiting for a job". The man who coined that defined a chemical engineer as "A man who is neither chemist nor an engineer". Shortly afterwards he became a consulting chemical engineer.

During the not so recent war, chemistry was visualized as a sort of miracle subject. Today it is visualized as less of a miracle but more of a routine tool of industry. One cannot visualize an industry where chemistry does not enter in; lead pencils or furniture, silk hose or cotton textiles, razor blades or locomotives. It might be expressed figuratively that every industry was born in a test tube.

Sometimes people evaluate on the wrong scale. The late Arthur D. Little tells the story of a letter reading, "How much will you charge me to analyze a pill so big" accompanied by a circle about five mm. in diameter. But that is the exception.

The relation of the consultant to his clients is often as close as that of the full-time employees. He knows all the manufacturing secrets of the firm, if indeed there are any manufacturing secrets in this age when some of the chemical manufacturers in their sales booklets not only tell the properties of their products but the processes by which they are manufactured. Of course we know there are secrets as to details.

Suppose we follow the story of the development of a laundry detergent as an illustration of a major problem of a consultant. An executive of a manufacturing company decided that although they maintain research and control laboratories it would be preferable to use part of his research fund for development of a soap builder of maximum efficiency in a consulting laboratory. Soap builders are materials added

to soap to make it more effective. The laboratory studied all present and potential soap builders, and decided from the data obtained that one not then manufactured would be most efficient. I refer to the relatively new sodium metasilicate industry. This took some years. Then in a few hours' time after it had been determined what to make, a commercial process was devised in the laboratory. It was proven in the laboratory within a few days. But on a tonnage basis one cannot work with evaporation dishes and small gas burners—not today. So equipment was selected for the operation of the process. It was installed, most of it second-hand, and put into operation, to produce one-half ton a day, still supervised by the consultant. This is the pilot plant stage, in this case a jump from 100 grams to 1,000 pounds per day. The process worked only after a fashion. The product was sticky rather than dry. The grinding operation produced too much fines to be reworked. The sizing equipment did not operate at the capacity it should. The batches cooled as expected but crystallization was delayed, sometimes for days. Pieces of equipment were torn out and replaced, in a search for the most satisfactory method of carrying out the operations on the one-half ton basis. Finally, the pilot plant operated satisfactorily, produced one-half ton a day steadily and the sales force sold all of that. Production costs were estimated from the pilot plant and proved a satisfactory profit margin to be present. Then, and only then, was equipment ordered and installed and a new building constructed to house it for production of 25,000 pounds a day, a step from 1,000 to 25,000 pounds, the commercial plant. The research on the pilot plant scale had been properly carried out, the results properly interpreted, so less trouble was encountered at this step. And at last, after overcoming a few more operating troubles, the transition was completed from the laboratory to the commercial plant. The story of a smaller or a larger project would be similar except as to magnitude.

The applications of chemistry today by the consultant are very diverse. In a consulting laboratory one finds one man working on the fabric used in shoes. Another is working out a new type of shoe polish or a new form of plastic. Then there's a man developing a modified process for use in printing. There are problems relating to soaps and soap powders, bricks, cement, asphalt, paints and varnishes, textiles of all kinds, silvered glass. You see what I mean by diversity. A recent curious inquiry was for a material that would not spoil, looked like milk and was non-poisonous. What do you think they

wanted it for? To put in nursing bottles for sale with dolls.

Then there are the impossible problems, too, such as this from an M.D. "I have found that feeding people who are unable to retain food in their stomach is a very serious problem. Why can't you chemists develop a food in gaseous form which could be inhaled by people with stomach disorders?" It took a chemist, you see, to point out to the M.D. that the functions of the digestive tract could not be transferred to the respiratory system, even by the skill of the chemist.

A consultant's laboratory may be a room with a desk, the actual physical laboratory equipment being elsewhere, or a small laboratory or multiple floors. It is not the white tiled laboratory depicted in the movies, although it reminds you of it, because it's so different. Some day some one ought to rig up one of these white tiled affairs and use it as an example of what a laboratory is not.

You are familiar with the general appearance of a lawyer's office. A consulting chemist's often has a close resemblance, although the same facilities may be utilized in a library. There are two publications, *Chemical Abstracts* and the *Patent Office Gazette*, which are among the most important tools. A lawyer looks up abstracts of previous decisions. A chemist, by reference to *Chemical Abstracts*, has abstracts of all the work published in over 2,000 journals throughout the world. So the consulting chemist starts the problem with a knowledge of what has been done, whether published in English, German or Siamese, and of what patents there are in the field. I was particularly struck recently by our dependence on *Chemical Abstracts* when some information was wanted quickly in a small city where *Chemical Abstracts* was not available. Four long distance calls and a half-day's time were required to furnish information otherwise obtainable in ten minutes.

Surprisingly enough, the majority of the experimental work in a consulting laboratory is not done with what are known as chemicals, but rather with commercial raw materials. By that I mean that C.P. sodium sulfate and pure oleic acid may be used in experiments to determine facts but in the development of products the "chemicals" used are synthetic resins, or wood flour, or grades of soap which are themselves mixtures rather than C.P. chemicals. The reason is obvious.

The analytical department of a consultant or a consulting laboratory is a very important division. Perhaps most laymen and many executives in industrial work think that all the work is carried out here.

Very often an inquiry for an analysis turns out to be a research problem involving experimental or development work along chemical lines, mechanical engineering and economics. The analytical department is important because practically all of the work done by consultants involves some sort of analysis. It too has its limitations such as when a feminine hypochondriac asks whether the "vegetable pills" she is taking are really made from vegetables.

It is only a simple modification of this when a department store or a chain of department stores makes the consultant their "Bureau of Standards" to supervise the quality of products they buy for resale.

It was told the other day of a striking example of qualitative analysis. A bottle of whiskey had turned black—iron tannate, of course. The chemist started to do a qualitative test for iron. When he shook the bottle it rattled. When he poured out the contents he also poured out a nut from the filling machine. I suggested that it was the most positive test for iron I had ever heard of.

Strictly speaking, the microscope is not a chemical instrument; it's a physical method of examination. But practically it is a part of the optical laboratory which always accompanies the chemical laboratory. With the microscope a crystal or a surface is magnified 100, or 300, or 1,000 times and, if you wish, recorded as a photomicrograph. These can now be made with a binocular microscope and mounted for use with the stereoscope to give three dimensional vision. A sort of exhibit very useful for a judge or jury, you know. You remember the old fashioned stereoscope on the parlor table or on the "what-not". It's rather striking to see the skin, or particles of pumice, or silica, or soap powders or starch grains, standing up in three dimensional vision like cliffs or big rocks. Along with this in the optical laboratory are polariscopes and refractometers for getting physical constants on materials, usually to identify them or detect adulteration. And there are the multitude of applications of color reading by the photometer which records the color of fabrics or paints or of anything. If it is white, gray or black instead of colored, it is recorded just as easily.

This suggests another typical activity of the consultant—court work. You doubtless recall the careful microscopic work of the wood expert in the Hauptmann case, later written up in detail in the *Saturday Evening Post*. Another expert has done marvelous work on bullets. He will mount two bullets under a comparison microscope so that the scratches from the "lands" of the gun barrel exactly coincide. The chemical expert has a similar function.

One case, more of a chemical nature, had to do with whether the blue color of razor blades protects them from rusting and whether two makes of blades were made under a certain patent. Since the blue film is only about 720 angstrom units thick, that's quite a problem. Or this example. In 1929 a firm had several thousand yards of linen fabric backed; that is, they joined the linen to a similar cotton fabric with a rubber cement. The linens are embroidered in fancy designs to be cut up later with the backing attached for use in making women's shoes. The well known depression came along and so the shoes weren't made; the fabric was stored. And when the owners of the fabric wanted to use it in 1933, lo, and behold, it was all stiff and the backing didn't stick at all. Some $250,000 damages were involved. Why? Careful separation of the cotton backing, the linen and the cement was made. Each was ashed and the ash dissolved in acid. The ash from the cotton showed no copper or manganese. The rubber cement showed a couple of parts per million of copper, and the linen showed 10 parts per million of copper. So the answer was that the dyeing of the fabric had been done in a copper vat, and enough copper dissolved with the dye to cause the rubber to deteriorate. It had migrated from the linen into the rubber during those years, and that was the cause. Examination of linen dyed different colors showed variation in the copper content and correspondingly difference in deterioration. So that solved that. And incidentally, a discovery recently reported indicates that addition of another substance, p-amidophenol, would have prevented the occurrence.

In such a case the consultant usually prepares the technical defense in full, then the lawyer injects the necessary legal phases into it and modifies it as may be necessary or desirable to correct the case to conform to the law, all before it is due in court, of course. There are consulting firms which specialize in legal work, and all firms, large and small, do some.

Which reminds me of two related cases. One was for hair dye poisoning by paraphenylene diamine. The evidence showed that the plaintiff had a case of skin irritation, but that the reason was just that she never took a bath,—well, hardly ever. There was no paraphenylene diamine in the hair dye. The other relates to a middle class housewife who bought a cloth coat with a fur collar. She developed dermatitis, that is skin irritation, and evidence showed that the fur of the collar was the cause. When dyed with paraphenylene diamine the

fur had not had the excess properly rinsed out. So the collar of her coat was poisoning her. Incidentally, she showed very fine reasoning in locating the cause of her dermatitis by noting that it became much worse when she wore the coat.

Sometimes there may be cases where ignorance is a good thing, but it is the exception rather than the rule. There is a case of a decorative stone for flooring and walls. The development of the formula was started industrially without a proper search of publications on the subject. When the search was made later by a chemist, the literature clearly showed that such a stone could not be made without warping. But meanwhile a method for preventing it from warping had been developed. That's the exception, though, not the rule. Many thousands of hours of work can be put on the solution of a problem only to find that it has already been solved—and the solution patented. There is a commercial waterproofing widely sold in the United States which was patented in California ten years ago. But the patentee apparently doesn't know that his patent is being widely and directly infringed.

The consultant often goes further than to develop a product. Suppose a product has been developed for a manufacturer and equipment installed for its manufacture. And then it has to be put into operation on a commercial scale—more work for the consultant. Sometimes the consultant runs the plant for weeks or months, or even years until everything is going smoothly.

And, of course, if the product is important enough there is the intermediate pilot plant. If the process doesn't work well on a small scale it won't on a large scale. One pilot plant operated for ten years before it ran well enough to justify putting in the commercial scale plant.

In advertising, the question is often raised of what can be said truthfully. Many advertising agencies use a consultant to tell them. The advice may be used or abused. Examples are the seven kinds of stains on teeth, which were widely publicized a few years ago, or the more recent work on the amount of tea which a person can tolerate without harm. As calculated from the amount which had no effect on four generations of rats, a human may safely drink 43 cups a day. Did I hear someone say, who wants to? I don't know.

That leads into radio broadcasting, either of daily programs or of spots on other programs over national hook-ups. That's a new field for the consulting chemist, but as you may know, both sustaining

and commercial programs of the type are on the air. The public seems to be very much interested as shown by hundreds of letters a week asking about how to remove spots from rugs, how to kill *cimex lectularius*—that's bed bugs—how to remove stains from bath tubs, etc. And so it goes.

The results of the work of the consultant, if suitable, are patented just the same as the results of a direct employee. And depending on the terms of the agreement they may or may not be assigned to the client for whom the work was done; usually they are.

Why?

The consultant must so coördinate the work he is doing to be able to get greater efficiency than is possible in a laboratory operated solely for one firm; if he cannot, he has no place in the scheme of things. As an illustration, a search of literature a few years ago on the waving of hair showed that the problem was one of applying heat and dilute alkali. That information from the literature was sufficient to suggest a suitable new method of hair waving on which patent was granted and the next year over two million waving pads were sold for the new method. That process was taken almost complete from work done on laundry detergency. Both are the effect of controlled alkalinity; the study had been made with laundry detergents; it was applicable to the other problem. And that's only one of many where apparently diverse problems are related. The machineless wave now so popular is a further modification of that by using quicklime, which with the water added generates heat, and more recently by the reaction of aluminum, potassium chloride, and potassium chlorate.

Fundamentally the consultant makes available to the small firm the same technical facilities which the large firm has, at a cost commensurate with the size of the company. But that might mislead you. The consultant also often works for some of the largest firms. In fact, you could hardly name a large firm which does not call in consultants from time to time for some form of service. It is more economical in many cases where a specialist is needed. So perhaps it is clearer to say that in chemical matters he fills the same function as a doctor, whether a general practitioner or a specialist, or that of a hospital in medical matters. Certainly it has those characteristics in problems such as these.

A firm is producing several thousand dozens a day of dolls. Many of them begin to come back with cracks across the face. What is

wrong? Certainly something needs to be done—fast. Or of a well-known toothpaste a few years ago. About 100,000 dozens were on the shelves of the retailers when it was found that they became hard so that they were more suitable for use as hammers. The answer in each case is a change in manufacturing method which overcomes the defect and overcoming it is a technical problem. If a change is not made quickly the patient—that is the firm—is apt to die a speedy financial death.

An Appreciation

Dr. Maximilian Toch, on his retirement as president of THE AMERICAN INSTITUTE OF CHEMISTS received an ebony gavel bearing the INSTITUTE emblem and the inscription: "Presented to Dr. Maximilian Toch on his retirement from the presidency of THE AMERICAN INSTITUTE OF CHEMISTS, with the appreciation of the National Council." Mr. Howard S. Neiman, Secretary of the INSTITUTE, made the presentation to Dr. Toch at the banquet on May fourteenth. His talk appears below:

"Mr. Toastmaster, members of the INSTITUTE, its guests, and your guests: Perhaps it is because I have been upon the National Council for more years than any other member that a most pleasant duty has been conferred upon me.

"The INSTITUTE is very young. Fifteen years are but a short space in the life of an organization of the character of the INSTITUTE. During its babyhood and early days it has had all the troubles accompanying babyhood. During the year immediately after its birth, it suffered from colic. We found it was not being fed the proper food, so we immediately and perhaps roughly weaned it from its mother and commenced to feed it on scientific foods upon which it grew rapidly. Then it reached the creeping age. The age at which a child starts across the floor for a definite object, turns aside, and bumps its head against the wall at the other side of the room. The age in which the child is liable to pull the tablecloth and all of the dishes down upon its head. And this child did that. Then its neighbors, noticing its growing strength, feared that it might eventually climb over the fence into their yard and steal a few of their flowers. They opened the doors and windows of its nursery room hoping it would catch double pneumonia and pass on to the final resting place of other organizations that had dared to be born. So then they attempted to poison the one food it had, its good will and reputation. But it lived through all of these.

Regularly every two or four years, we picked out a good nurse for it, each one possessing qualifications suitable for the particular age of our infant. They were all successful, and the child grew and prospered under their care. Two years ago we appreciated that the child was passing through childhood into early youth. The child must be taught that having started for an object, it should make its way there irrespective of all obstacles and impediments that might be placed in its way. This was the time in which it was necessary to take the child by the hand and lead it into proper ways of life, interrupted now and then by a terminal argument with father in the woodshed. We went over the list of members very carefully. It was a most important period of this child's life, and we finally decided upon a man of experience, a man with a knowledge of chemistry, a man respected by everyone who knew him. But we knew that he would not accept. We knew that he would rather dabble around with his chemistry and photography and follow his Saint, Isaac Walton. And then we played a dirty trick on him. We waited until he was in Europe and then we elected him, and after he was elected we cabled him he had been nominated. He is a hard taskmaster. He is strictly for the proprieties. He insisted that all of the meetings of the Council should be conducted strictly along parliamentary rules—as long as they served his purpose. If a discussion upon a subject extended for more than five minutes, he banged upon the table and said, 'Motion passed unanimously', but the more he bossed us, the more we loved him, and we soon found that our hopes and expectations were more than satisfied. When he came into office, we were a financial 'red'. He balanced the budget. He has done more in two years than the national administration has been able to do in six years. The INSTITUTE is now more respected and appreciated than it has ever been before. He has impressed the chemists to recognize the fact that it is the opportunity for them to advance through social and scientific efforts. It is through his efforts that the unemployment bureau was incorporated into the Chemist Advisory Council, an organization which will undoubtedly prove of the greatest value to chemists in the future years.

"Dr. Toch, you have been the recipient of many medals, you have received many tokens of appreciation from many organizations, many institutions have conferred degrees upon you; but none of these has ever carried with it a higher appreciation of your ability or a deeper affection for you personally than the one I now present to you on behalf of the Council of THE AMERICAN INSTITUTE OF CHEMISTS."

The Repair and Preservation of Records in the National Archives

By ARTHUR E. KIMBERLY

The Chief of the Division of Repair and Preservation, The National Archives, Washington, D. C., calls attention to chemists' contributions in this field.

THE DIVISION of Repair and Preservation of The National Archives is charged with the preservation of all records in the custody of the Archivist of the United States. This responsibility covers the fumigation, cleaning, and repairing of archival material of any sort, as well as the supervision of the operation of the air-conditioning system so as to insure optimum storage conditions. Since no other similar institution has ever dealt with the volume and variety of records now confronting The National Archives, it has been necessary to devise new methods for treating this material, and it is the purpose of this article to describe the equipment and procedures now used in the Division of Repair and Preservation.

Fumigation

All incoming material is fumigated to assure complete elimination of insects, fungi, and other similar pests. This operation is carried out in either of two rectangular tanks measuring 4½ x 5½ x 11 ft., which are shown in Figure 1. The records are placed in a vault in their original containers and the vault is evacuated until a vacuum of approximately 29.9 in. of mercury is obtained. A mixture of ethylene oxide and carbon dioxide is then released into the chamber until the vacuum falls to 21 in. of mercury. The gas is then agitated for 15 minutes by pumping it out at the top and in at the sides of the chamber. After the records have been exposed for a total of 3 hours the chamber is reevacuated to 29.8 in. of mercury; the vacuum is broken with air, and the fumigated materials are removed. Insects in any stage of development, as well as any mold spores which may be present, are effectively exterminated by this treatment.

During the fiscal year just past, 35,673 units ranging in size from a single volume to boxes weighing 1200 pounds were fumigated.

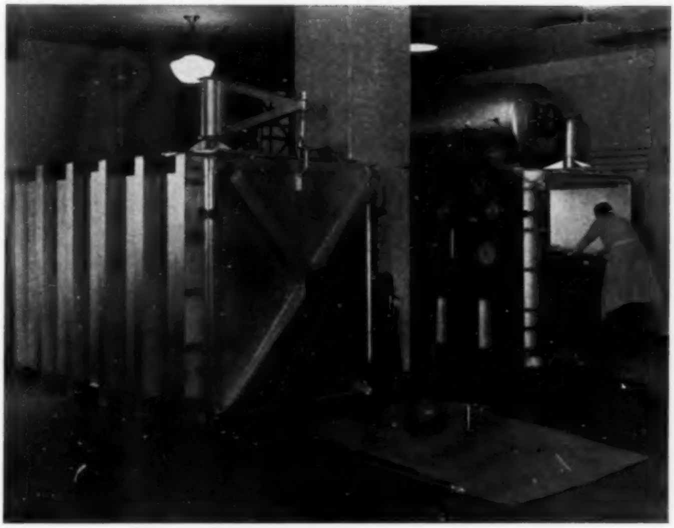

Fig. 1. Fumigating Vaults.

Cleaning

After fumigation the records are cleaned by means of an air blast applied through an especially designed gun. This method of cleaning was adopted after the completion of an extensive series of experiments for the purpose of determining the safest and most rapid method of removing dust and dirt from fragile records. The methods examined included hand dusting with a brush and with a soft cloth, vacuum cleaning, and the air blast.

The cleaning operation is performed in an all-metal cleaning unit composed of two hooded tables and an air filter. This equipment is shown in Figure 2. The working surfaces and the backs of the tables are of heavy bronze screen through which is drawn the dust-laden air blown from the records. The dirty air passes through ducts within the tables into the filter, which removes the dust and returns the clean air to the room. From time to time as it becomes necessary, the filter mats, which are of cellulose wadding, are cleaned with a vacuum cleaner. This new method has given excellent results since its initiation early in 1936, and similar equipment is now being installed in several other archival depositories elsewhere in the United States.

Approximately 45,000,000 documents and 50,000 bound volumes were cleaned during the fiscal year 1937.

Flattening

The next step in the treatment of unbound records is the removal of folds, wrinkles, and creases to permit storage in a horizontal position. In order to obtain satisfactory flattening it is first necessary to render the paper fibers flexible by the addition of water, but the use of liquid water on documents dating later than 1840 is dangerous, because of the water soluble nature of many of the inks and other writing materials used since that date. In The National Archives, therefore, documents to be flattened are exposed on stainless steel trays to the action of air containing a large amount of water vapor (90 per cent to 95 per cent relative humidity). This exposure, which is carried out in a vault equipped for the purpose, (see Figure 3) generally lasts about an hour, during which time the paper absorbs water in the vapor phase, thus eliminating any possibility of the formation of a liquid layer upon the surface of the document. When satisfactory humidification has been attained the documents are removed from the vault.

Fig. 2. Air brushing the records.

Fig. 3. Humidifying Vault.

If the material under treatment is in reasonably good condition, the individual sheets are ironed in electrically operated mangles equipped with thermostatically controlled, electrically heated shoes. These machines (Figure 4) are similar to household ironing machines. On the other hand, if the documents are fragile or fragmentary in character, each sheet is placed between sheets of white blotting paper and dried under heat and pressure in a hydraulic press. Approximately 685,000 sheets have been flattened to date.

Repairing

The two varieties of archival material (i.e., unbound and bound) handled by The National Archives require radically different treatment to prepare them for preservation, and it was necessary to devise a specific technique for each type of work. In the case of unbound records, which constitute approximately 90 per cent of the material handled thus far, an investigation of the various methods of repairing

Fig. 4. Flattening records in an electric mangle.

and reenforcing such material indicated that all the procedures commonly used for this purpose, prior to the entrance of The National Archives into the field, involved the manual application of an aqueous adhesive and some reenforcing substance such as Japanese tissue paper or a coarsely woven silk fabric (crepeline). Such treatment increases the durability (resistance to the wear and tear of handling) of the document but does not improve its permanence qualities (resistance to other deteriorating influences such as light, heat, and acidic gases). Moreover, the operations involved are tedious and delicate and require skill obtainable only through long training and experience. Consideration of these facts indicated that the task of treating millions of documents by such methods was well-nigh impossible.

The ideal preservation process is one in which the documents are sealed permanently against the harmful gases of the atmosphere, in which no adhesive is necessary, and in which the various operations may be performed rapidly and easily by workers of average intelligence and ability. Such a process had been proposed by the National Bureau of Standards for the preservation of newsprint as early as 1934 (see

Bureau of Standards Miscellaneous Publication Number M-154, Summary Report of Bureau of Standards Research on the Preservation of Records, by A. E. Kimberly and B. W. Scribner). As a result of research in the Division of Repair and Preservation, this process has been successfully adapted for use on all common varieties of paper.

According to the modified procedure developed, a document to be repaired is placed between two sheets of thin cellulose acetate foil (.00088 in. thick), which, being thermoplastic, adheres to the paper upon the application of heat and pressure in a hydraulic press. The preparation of a document for lamination is shown in Figure 5. The degree of heat and pressure necessary varies with the type of paper under treatment. Documents so treated are relatively impervious to gases and if necessary may be cleaned with soap and water. Tests of the permanence of laminated records by the National Bureau of Standards indicate that they are unaffected by the normal processes of deterioration. Moreover, the cost of treatment by this process is only 25 per cent of the cost of preservation by other methods.

The hydraulic press (see Figure 6) now in operation in The National Archives will take material as large as 21 x 36 in. and has an annual

Fig. 5. Preparing records for lamination with cellulose acetate.

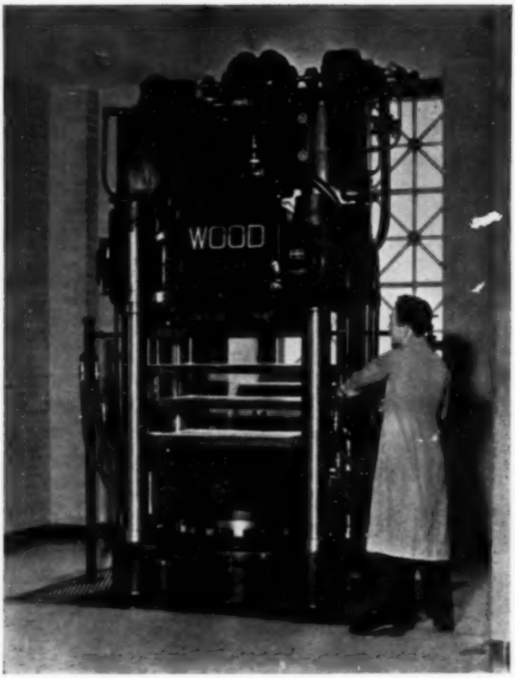

Fig. 6. Hydraulic press used for lamination.

capacity of 400,000 letter size sheets. An added advantage of the process from the archival viewpoint is the fact that once a document has been laminated with cellulose acetate foil, alteration of the document is exceedingly difficult if not impossible.

Archival binding or the repair of bound records differs from library binding in that every effort is made to preserve the records in their original form and binding. The technique employed is, therefore, almost diametrically opposed to edition or library binding operations, which involve the replacement of torn covers and the like. A record is kept of the extent of the work performed on each volume.

Control of Storage Conditions

The preservation of records requires close control of the temperature, relative humidity, sulphur dioxide content, and dust content of the air in the storage spaces. The optimum conditions of temperature and relative humidity for satisfactory storage are 70° F. plus or minus 2°

and 50 per cent plus or minus 2 per cent. As an aid in controlling the temperature and moisture content of the air within these narrow limits, wet and dry bulb temperatures are determined twice daily at two or more stations on each tier of every occupied stack area. The number of such daily determinations made at present is 112 and more data of this sort will be gathered as the number of occupied stack areas (see Figure 7) increases.

Since it has been shown that concentrations of sulphur dioxide as low as 1 part sulphur dioxide in 5,000,000 parts of air are definitely harmful to paper and other record materials, the elimination of this acidic gas from the atmosphere of storage areas is highly desirable. It has been found that if the hydrogen ion concentration of the water used to wash the air prior to its introduction into the storage areas is

Fig. 7. A view of the stack areas.

Fig. 8. Chemical laboratory.

maintained between pH 8.5 and 9, sulphur dioxide is completely removed. The alkalinity of the wash water is kept within this range by the addition of small amounts of chemicals, and determinations of the pH of the wash water are made hourly as an aid in this program.

It is desirable to reduce the dust content of the air in the storage space to a minimum, for angular dust particles exert an abrasive effect on records and also act as nuclei for the condensation of acidic moisture. The dust content of the air delivered by each air washer is, therefore, determined daily, and the results are plotted over a period of time so that some idea of the progress made in dust elimination may be obtained. The chemical laboratory of The National Archives is shown in Figure 8.

Conclusion

It is believed that The National Archives is the first archival depository to utilize scientifically trained personnel in the treatment of archives with respect to repair and preservation and the results so far obtained have been quite satisfactory.

Chemist Advisory Council

By M. R. Bhagwat, F.A.I.C.

THE CHEMIST ADVISORY COUNCIL, as successor to the Committee on Unemployment and Relief for Chemists and Chemical Engineers (also known as the Chemists' Unemployment Committee), is endeavoring to study the question of unemployment of members of the chemical profession. Unemployed chemists are encouraged to register with the Council and, in turn, the Council is endeavoring to render assistance in several directions, be it advice or more tangible relief where the urgency of the case demands the latter course.

It is the plan of the Council, as soon as conditions permit and the finances are available, to establish a bureau of employment to undertake to bring together employers and applicants fitted to the work offered, but up to the present time such agency is not yet established. However, the Council does maintain a registration of unemployed chemists, with rather complete case history and from which records we shall some day be able to throw light upon the question of unemployment within the profession.

In the first four months, January to April of the calendar year 1938, the Council has registered 97 unemployed chemists or chemical engineers, all of whom qualify under one of the three groups:

A—Registrants having a B.S. degree with two or more years' industrial experience.

B—Registrants having an M.A. degree with more than one year's industrial experience.

C—Registrants having a Ph.D. degree.

The ages of these registrants fall into the following groups:

45 and above	12
35-44	30
Below 35	47
Unknown	8

The classification according to education:

Ph.D.	15
M.A. or M.S.	25
B.S.	57

The classifiation according to industrial experience:

Less than 5 years	31
6 — 10 years	19
11 — 20 years	30
Over 20 years	17

Four non-graduates having more than five years of industrial experience sufficient to qualify them as chemists or chemical engineers have registered. These men have all attended one or more institutions of higher education but do not possess chemical degrees.

95 persons have registered possessing

A—B.S. degree or its equivalent but less than 2 years' industrial experience.

B—Master's degree with less than one year's experience.

C—Foreign degrees where the educational status cannot be exactly classified.

The total registration for the four months amounts to 196, and has shown an increase during the second quarter much more rapidly than during the first quarter.

THE CHEMIST will not appear again this summer until September. The reports given at the Annual Meeting of THE AMERICAN INSTITUTE OF CHEMISTS, which summarize the INSTITUTE's activities during the fiscal year 1937-1938, are contained in this issue of THE CHEMIST. Members are invited to read these reports and send comments or suggestions to the appropriate committee or to the secretary. It is through the united efforts of our membership that the professional and economic status of American chemists will be advanced.

The September CHEMIST will carry an article by Dr. Frederick W. Zerban, F.A.I.C., who is in charge of the New York Sugar Trade Laboratory, on "The Chemist in the Sugar Industry"; an article by Paul H. M.-P. Brinton, consulting chemist, Pasadena, California, on "The Interpretation of Spectrographic Analyses", and other material of professional interest.

Information about important work being undertaken by members of the INSTITUTE, activities during the summer, and items of interest to chemists, or articles on professional subjects, are always welcome.

Annual Meeting — 1938

The Sixteenth Annual Business Meeting of THE AMERICAN INSTITUTE OF CHEMISTS was held at Atlantic City, New Jersey, on May 14, 1938, at four o'clock in the afternoon. The following reports were presented and accepted.

Report of the Secretary

I am pleased to submit this report of the activities of THE AMERICAN INSTITUTE OF CHEMISTS during the season 1937-1938.

The following actions upon the membership were taken by the National Council during the year:

Elections

Honorary Members	4
Life Members	1
Fellows	272
Associates	8
Juniors	26
Students	0
Total	311

Loss of Membership

Resignations

Fellows	30
Associates	4
Juniors	4
Total	38

Dropped

Fellows	55
Associates	20
Juniors	23
Students	1
Total	101

Deceased

Fellows	6

Reinstated

Fellows	2
Total Loss	141
Net increase	170

Actions

Associates raised to Fellows	4
Students raised to Fellows	1
Juniors raised to Associates	2

Membership

	May 1, 1937	May 1, 1938
Honorary	6	10
Life	2	3
Fellows	895	1083
Associates	113	95
Juniors	101	98
Students	8	6
	1125	1295

The National Council held 11 meetings during the year with an average attendance of 10 councilors. We have today the largest membership in the history of the INSTITUTE and we can well be proud of the high scholarship and scientific standing of our members. The credit for this increase in membership belongs almost entirely to the activities of the membership comittee under the leadership of the chairman, Dr. W. T. Read, who has been the energetic and untiring leader of the nominating committee for the past three years, during which period the membership has increased from 666 to 1295, thus practically doubling the membership during the past three years.

During the past year over 25,000 pieces of mail have been issued by the Secretary's office, not including the

copies of THE CHEMIST; and the migratory tendency of the members is indicated by the fact that over 400 changes of address were entered during that period.

After careful consideration, the Council determined the desirability of maintaining the membership dues at its former figure and of placing THE CHEMIST upon a subscription basis. It is gratifying to note that the proportion of members who have not subscribed is extremely small.

In order that the INSTITUTE roll should include only active members, 101 members were dropped for nonpayment of dues, and it is gratifying to know that the dues of 87% of the members have been paid to date.

Perhaps the most important activity of the INSTITUTE during the past year has been the formation of Chemist Advisory Council, Inc., which organization has absorbed the activities of the Committee on Unemployment and Relief for Chemists and Chemical Engineers, which has performed such valuable services to chemists during its existence, and it is believed that under the sponsorship of THE AMERICAN INSTITUTE OF CHEMISTS the broadening out of the activities of Chemist Advisory Council to national scope will prove of the greatest value to chemists.

The forwarding of the activities of the INSTITUTE are largely the result of the untiring enthusiasm of its president, Dr. Maximilian Toch.

The Jury on Medal Award has awarded the INSTITUTE medal to Dr. Frederick G. Cottrell for noteworthy and outstanding service to the science of chemistry and to the profession of chemist in America.

The reports of the president, treasurer, the chapters, and the various committees will further indicate the activities of the INSTITUTE and need not be here repeated.

It is again a great pleasure to me to thus publically express my appreciation of the valuable and loyal service of my assistant, Miss V. F. Kimball, both in her assistance to me as secretary and in her capable capacity as editor of THE CHEMIST.

HOWARD S. NEIMAN, *Secretary*

Report of the Committee on Unemployment

The members of THE AMERICAN INSTITUTE OF CHEMISTS would indeed read with gratification of the developments in the life of the New York metropolitan unemployment committee, sponsored by the INSTITUTE, in the February, 1938, issue of THE CHEMIST.

The National Council of THE AMERICAN INSTITUTE OF CHEMISTS discussed the problem of the future of the emergency unemployment committee at their various meetings during the past year and felt that a permanent and independent organization devoted to the welfare of chemists would accomplish the purposes more effectively than an organization operating as a branch of a single society. The members of your Committee on Unemployment attended these council meetings and helped in the organization of Chemist Advisory Council.

This new organization desires endorsement from all societies and associations in the chemical profession. THE AMERICAN INSTITUTE OF CHEMISTS has given its full endorsement to the objectives of the Council. The American Chemical Society expresses its complete sympathy to the objectives of the Council, as stated in the charter. The success of the new venture, how-

ever, will depend upon the assistance of every member of the chemical profession.

Since the beginning of the year to the end of April, 196 chemists or chemical engineers have registered, of whom the qualifications of 97 show that they are graduates with more than two years' industrial experience or post-graduates having more than one year's experience. The remainder have received chemical or chemical engineering degrees and are classified in the Junior or Apprentice group. (A more detailed classification of this registration will be published in an early issue of THE CHEMIST.)

The members of THE AMERICAN INSTITUTE OF CHEMISTS are earnestly requested to inform unemployed chemists to forward their complete chronological records of education and experience to the Council's office. Accurate data regarding the extent of unemployment will be very helpful to the Council in planning a program to assist those unemployed in the profession.

A complete report of the emergency unemployment committee, was published in the March issue of the THE CHEMIST.

M. R. BHAGWAT, *Chairman*

Report of Committee on Economic Welfare of Chemists

In reference to the request regarding a report to the Annual Meeting of the INSTITUTE, I can state the following: I have communicated with Dr. Bhagwat in regard to some of the items which we recommend as part of the functions of the Committee on Economic Welfare.

The other item is in regard to the survey of the economic status of the chemist. In view of the belated notification of this committee's membership it is not possible at this time to give a complete report. Nevertheless, this matter has been taken up with the Department of Labor which has agreed in principle to make such a survey, and copies of previous surveys ot the Engineering profession have been distributed to members of the committee.

The principal question which has arisen is that such a survey should have the active coöperation, or to say the least, no active opposition from the largest body of chemists it is possible to reach. For this reason Dr. Lubin has sought to contact other groups of chemists than the INSTITUTE, in order to be assured that there would be the same coöperation in making this survey as has been provided with those for the chemical engineers, electrical engineers, doctors, lawyers, etc. Practically every other profession besides chemists has been surveyed in regard to its economic status, that is to say, its income as a function of education, training experience, employment or non-employment, and type of employment. These have been broken down into numerous publications by the Department of Labor, which are available to all, and which treat these matters with a profound and detailed analysis.

It is our hope that this same procedure will be carried out for the chemical profession. It is expected that with the coöperation of this Committee it may be realized.

In view of these circumstances I cannot make a detailed report for the Annual Meeting but would like you to accept this as a temporary report.

JAMES H. HIBBEN, *Chairman*

Treasurer's Report

The American Institute of Chemists
Schedule of Income and Expenses
For the Year Ended April 30, 1938

Income

Members Dues, 1937-38		$4954.50
Less Reserve for Chapter Refunds		338.23
Net Income from Dues		$4616.27
Contributions		1112.00
THE CHEMIST, *Publication*		
Income from Advertising	$1086.91	
Income from Subscriptions	2228.02	
Gross Income	$3314.93	
Less Costs of Publishing	2724.25	
Net Income from THE CHEMIST		590.68
Total Income for Year		$6318.95

Expenses

Office Rent	$ 600.00
Office Light	27.84
Office Salaries	2115.00
Social Security Taxes	21.15
Medals	64.64
Council Meetings	51.66
Membership Expenses	610.39
Telephone & Telegraph	145.06
Postage	366.45
Stationery and Printing	265.34
Towels	17.40
Accounting Fees	100.00
Commissions	67.00
Reserve for Delinquent Dues, Written Off	139.00
Cost of Banquet, Net	66.53
General Expenses	6.70
Total Expenses for Year	$4664.16
Net Income for Year Ended April 30, 1938	$1654.79

Auditor's Report

THE AMERICAN INSTITUTE OF CHEMISTS,
233 Broadway,
New York City, N. Y.

Gentlemen:

In accordance with your instructions, I have audited your books and records for the year ended April 30, 1938, and submit herewith a Balance Sheet as of that date together with a statement of Income and Expenses for the year and a statement of Cash Receipts and Disbursements.

The cash in bank was verified by reconciliation with the bank statement, and satisfactory vouchers were presented for all items under audit. Dues receivable from members amounts to $1083.00 and represents the following years and amounts:

1937-38	$ 681.00
1936-37	284.00
1935-36	76.00
1934-35	42.00
Total	$1083.00

The reserve for delinquent dues was established arbitrarily at fifty percent of the total outstanding and unpaid dues.

The excess of income over expenses amounted to $1654.79 for the fiscal year ended April 30, 1938. This marks a distinct improvement over the previous year when there was a deficit of $50.91. This improvement was

occasioned chiefly by the fact that there was an actual net profit in the publication of THE CHEMIST amounting to $590.68 whereas last year there was a loss incurred which amounted to $1851.82. There was also an increase in dues of members over the previous year amounting to about $1300.00.

The surplus account on April 30, 1938, was $1732.93 and represents an increase of $1654.79 for the year. This increase is the amount as shown in the schedule of income and expenses.

Your total membership increased from 1125 on April 30, 1937 to 1295 on April 30, 1938, as indicated on the schedule of membership changes.

In my opinion, the Balance Sheet submitted herewith, and the related statements of Income and Expenses together with accompanying schedules, correctly present the financial position of THE AMERICAN INSTITUTE OF CHEMISTS on April 30, 1938, and are in accordance with the books and records.

Respectfully submitted,

JACOB A. LICHTENFELD,
Certified Public Accountant.

Report of the Editor of THE CHEMIST

The policy of fully reporting the activities of the INSTITUTE has been maintained in order to encourage close coöperation between the members and the Council.

THE CHEMIST has also been an open forum for the expression of many ideas concerning the profession of chemist. Some of these articles have been both severely criticized and highly praised, which indicates at least their thought-provoking power and the need for more general discussion of chemists' professional problems.

Much outside interest has been shown to THE CHEMIST, which, of course, is good publicity for the INSTITUTE. Articles appearing in THE CHEMIST this winter have been reprinted in part in professional publications from Chicago to London, inclusive. We might also mention that INSTITUTE publicity, such as our annual meeting and medal award, was handled in this office, and a great many news clippings which are still being received testify to the interest which INSTITUTE activities have for the press in general.

We are indeed happy to report that the system of a subscription price for THE CHEMIST has enabled this publication to pay its own expenses this year and to show a substantial profit. This system will enable THE CHEMIST, we hope, to increase its scope and material for the coming year. Attention may well be called to the possibility of increasing advertising with a view to reducing the subscription price to members.

We are exceedingly grateful to all those who contributed so materially to THE CHEMIST by way of departments or articles, news items, book reviews, or interesting clippings. THE CHEMIST depends upon the coöperation it receives from the members of the INSTITUTE, and we trust that in the future it may receive even greater coöperation. Every member is cordially invited to send us news of his activities which may be of information or interest to chemists.

Our appreciation is also extended to the officers and councilors of the INSTITUTE for their support and coöperation, and particularly to Mr. Howard S. Neiman, whose unfailing devotion to the INSTITUTE has contributed so much to its progress.

VERA F. KIMBALL, *Editor*

Report of the Committee on Membership

Since June, 1937, this committee has invited approximately 4,000 fully qualified chemists to submit applications to become Fellows of THE AMERICAN INSTITUTE OF CHEMISTS. These chemists were chosen from every state in the union on the basis of published records of their training, positions and scientific achievements. Of this number 244 have been elected as Fellows during the past year. A number of others will probably apply later. Many who were not able to accept the invitation expressed themselves as being in sympathy with the work of the INSTITUTE.

These names are arranged by states, and also by cities. Any member of the INSTITUTE may have a list of the names in his city or state. Further invitations should come from individual members.

W. T. READ, *Chairman*

Report of Committee on Honorary Membership

Your Committee on Honorary Membership recommended to the Council the election of W. W. Buffum and George C. Lewis as Honorary Members. These two gentlemen were unanimously elected by the National Council and have accepted election.

W. T. READ, *Chairman*

Niagara Chapter Report—1937-1938

The Niagara Chapter submits the following report covering the year 1937-1938.

Six meetings were held during the year, of which the first, at the summer cottage of Dr. Arthur W. Burwell on the shores of Lake Ontario, was purely social. The other five meetings may be found fully described in the current issues of THE CHEMIST. Attendance consisted for the most part of members of the chapter, but in each case there was a sprinkling of prospective members invited by individuals. The custom instituted by the first chairman of relying almost entirely on talent within the chapter for our speakers has been continued, only occasionally going outside for help, as for instance in the discussion of chemical patents. The group is still small enough so that it can meet for dinner and all sit around one table for the meeting and discussion which follow.

Unemployment does not constitute the problem in this area which it apparently presents elsewhere. The chapter committee, however, works in close harmony with a similar committee of the Western New York Section of the American Chemical Society, and we now are coöperating with the Chemist Advisory Council. It is our hope that in the future data will be freely exchanged between our committee and others around the country. There is still a field for the rearrangements of misfits or the square pegs in round holes, however.

The public relations and publicity committees have worked together to present chemistry and chemists to the people of the Niagara Frontier in a dignified manner. Among other activities the Chapter has sponsored a series of newspaper articles, really interviews, written by a member collaborating with the reporter but appearing in print with the note "material furnished by the Niagara Chapter of the AMERICAN INSTITUTE OF CHEMISTS." In addition, the Western New York Section of the American Chemical Society has kindly thrown

open the pages of its local magazine to notices, write-ups, etc. of AMERICAN INSTITUTE OF CHEMIST'S events.

On one occasion recently the Chapter has coöperated with various other professional organizations in protesting certain items of legislation which were pending at Washington, namely, the bill for the facilitation of the licensing of patents. A committee has now been set up for the purpose of keeping an eye on future developments at both the national and state capitals.

A detailed mention of chapter officers who have served faithfully and efficiently would but burden the reader of this report with a list of names at the risk, furthermore, of some accidental omissions. The chapter year could not have been brought to so successful a conclusion without the whole-hearted coöperation which every officer and member has so consistently shown.

HOWARD W. POST, *Chairman*

Report of the New York Chapter—1937-1938

To transact the business of the New York Chapter three meetings of the Council were held, at the first of which suitable dates for the year's four Chapter meetings were selected. These meetings were all preceded by dinner at The Chemists' Club; the average attendance being seventy members and guests to hear addresses by:

A. Cressy Morrison on "The Committee on Unemployment".

Nelson Littell on "Reforming the Patent Laws".

Florence E. Wall on "The Status of Women Chemists".

F. W. Zerban on "The Chemist in the Sugar Industry".

Three of the speakers are members of our INSTITUTE and their subjects were well discussed by their audiences.

The Chairman appointed and received acceptances from the following five Fellows to coöperate with the Chemist Advisory Council: George A. Burrell, Foster Dee Snell, H. G. Lindwall, R. E. Kirk, and Louis Weisberg.

Six medals were struck, engraved and presented to local college students as selected by their respective teachers of chemistry.

Due to the efficient management of the affairs of the INSTITUTE by its officers, the New York Chapter received its dues rebates to date so that the Chapter Treasury is in a sound financial condition.

W T. READ, *Chairman,*
JAMES W. H. RANDALL,
Secretary-Treasurer.

Foster Dee Snell, F.A.I.C., addressed the students in the departments of chemistry and chemical engineering at The Polytechnic Institute of Brooklyn on April eighth on the subject of "Opportunities in Chemistry and Chemical Engineering".

Beverly L. Clarke, F.A.I.C., spoke on "Microanalysis" at a meeting of The Electrochemical Society held May twentieth, at New York University, New York, N. Y. He is head of the Analytical Chemistry Division of the Bell Telephone Company.

Report of the Pennsylvania Chapter

The activities of the Pennsylvania Chapter during the past year have shown considerable progress over those of the previous few years. Seven meetings were held during the year, with the regular meeting date on Tuesday following the third Thursday of each month. The meetings were held in the Board Room of the Engineers Club, where the chapter held an informal dinner preceding the meetings.

Following the first meeting of the year, the Chairman announced a schedule of programs for the meetings during the remainder of the year which initiated the custom of relying almost entirely on talent within the chapter for the speakers. The selection of a regular meeting place and date, the announcement of the year's programs in advance and the caliber of these programs have served to stimulate the interest of the members to an extent that our attendance has increased from an average of twelve for the previous year to an average of twenty-eight for the meetings of this year. With such a large attendance at our regular meetings, the interest and enthusiasm of the informal discussions which follow the regular programs have added much to our chapter activities.

As speakers for our programs we have had Mr. J. I. Wexlin of the Bausch & Lomb Co.; Dr. G. E. Seil, F.A.I.C. of the E. J. Lavino Co.; Dr. W. F. Stericker, F.A.I.C. of the Philadelphia Quartz Co.; Dr. W. F. Farragher of the Catalytic Development Co.; Mr. Franklin D. Jones, F.A.I.C., Consulting Chemist; Mr. C. Maurice Conner, A.A.I.C., Consulting Chemist; and Dr. James E. Shrader of the Drexel Institute. The activities of the chapter will come to a close for the year 1937-38 with the annual outing at the Oak Terrace Country Club, Ambler, Pa., on June twenty-fifth.

The activities of the chapter are receiving recognition beyond the realm of its own membership. We are represented on the Technical Advisory Council of the Chamber of Commerce of Philadelphia and on the Technical Service Committee of Philadelphia. Certain members of the chapter have taken an active part in the development leading up to the formation of the Association of Chemists in the State of Pennsylvania. Our public relations and publicity activities could be pushed more vigorously with greater advantage to the chapter and INSTITUTE.

The chapter is pleased with its increase in membership and is hopeful that these gains may be extended further. We have initiated the awarding of the Student Medals for the first time and students at six schools have been selected as recipients of the Award this year. It is interesting to note that the activities of the chapter are arousing the interest of a larger number of our college students in the Pennsylvania area as indicated by the increased number that have applied for Junior or Student membership.

The progress of the chapter for the past year has been due to the efforts of the chairman, with the wholehearted support and coöperation of the officers and members. It is expected that the Pennsylvania Chapter will continue its progress in the future under the leadership of the newly elected officers for the year 1938-39.

MAURICE L. MOORE, *Secretary*.

Annual Report of the Washington Chapter—1937-1938

The Washington Chapter during the past year progressed largely along the lines laid down the year before.

The meeting place for the regular evening meetings was changed from the Cosmos Club to the Wardman Park Hotel. This move was made in the hope of inducing a larger attendence, but sad to relate the hope was not realized. We evidently have to be reconciled to the idea that the evening meetings, for a variety of reasons, will not draw much over a corporal's guard.

We have held three of these evening meetings so far this season, with one more (election) in the offing. The first meeting was made interesting by a talk of a member of the Chinese legation, Mr. N. W. Chien, who gave an authentic, first-hand account of conditions in his country. The second meeting was arranged as a membership drive. Mr. Frank G. Breyer was our guest speaker on this occasion.

Although, as stated, the picture is a bit weak as far as these meetings were concerned, the monthly luncheons, held in the private dining room of the U. S. Department of Agriculture, were successful. These affairs, one member has stated, really kept the local organization going. As guest speakers at the luncheons we had Mr. A. D. Willard of the Columbia Broadcasting System; Mr. Shirley Povich, sports writer of the Washington Post; Mr. A. E. Kimberly of the National Archives; Mr. Thos. R. Henry, science columnist of the Washington Star; Mr. James S. Robb of the American Airlines; and Mr. David J. Guy, power authority of the U. S. Chamber of Commerce. Each of these speakers brought an interesting message.

The group visited the Washington airport as an aftermath of Mr. Robb's talk, and learned something of how the flying business is managed. The annual visit to Baltimore is scheduled for May 13th, when we expect to inspect the plant of the Maryland Glass Corporation.

It is gratifying to report that the increase in membership of this Chapter closely parallels the national growth. The luncheons are partly responsible for this increase.

This Chapter is responsible for the survey of the chemical profession by the U. S. Department of Labor, which has been authorized by the Council. The Chapter is pleased with this action on the part of the Council. It is also pleased with the Council's efforts in establishing the Chemist Advisory Council. It feels, however, in the interest of retaining the present rank and file of membership, and to attract new members, that a positive practical activity, touching on the careers of all chemists should be engaged in and duly publicized. We can not yet afford to "sit back" and survey accomplishments; we must still be vigilant.

The greetings of the Washington Chapter go to the national organization on this, the 1938 Annual Meeting.

L. N. Markwood, *President*

May Meeting

The one-hundred and fifty-third meeting of the Council of THE AMERICAN INSTITUTE OF CHEMISTS was held at The Claridge Hotel, Atlantic City, New Jersey, on May 14, 1938, at 12:30 noon.

President Maximilian Toch presided. The following officers and councilors were present: Messrs: J. W. E. Harrisson, R. J. Moore, H. S. Neiman, W. T. Read, N. A. Shepard, M. Toch, and F. W. Zerban. Messrs. H. W. Post, M. R. Bhagwat, G. E. Seil, F. D. Snell, W. D. Turner, and Miss V. F. Kimball were present.

The minutes of the previous meeting were accepted.

The Treasurer's report, showing a bank balance of $805.51, was read and accepted.

The Secretary read a letter from the Niagara Chapter which contained suggestions for reorganizing the INSTITUTE, and the Secretary was instructed to reply that the matter had been discussed and would be presented to the new Council at its next meeting.

Dr. W. T. Read announced that the following students had been selected for student medal awards from the New York Chapter: Mary Noniewicz, College of Saint Elizabeth; Alice E. Billman, New Jersey College for Women; Alfred E. Brown, Rutgers University; Stanley August, New York University; Hubert G. Davis, Columbia University; Saul Chodroff, Brooklyn College; Irving A. Cohen, New York University, University Heights; Isidore Kirshenbaum, The College of the City of New York; Thomas G. Wheat, Polytechnic Institute of Brooklyn.

Dr. J. W. E. Harrisson announced that the following students had been selected for student medal awards from the Pennsylvania Chapter: George Judas Bateman, University of Pennsylvania; Kenneth Shull, Philadelphia College of Pharmacy and

Science; William Reiff Seipt, Drexel Institute of Technology; Harry B. Kime, Temple University; William George Dukek, Jr., Lehigh University; Edward John Gornowski, Villanova College.

The Washington Chapter awarded the following student medals: Robert Crocker Brasted, George Washington University; Julian Keith Lawson, Jr., University of Maryland; Henry Sonneborn, III, Johns Hopkins University; Edward Otto Ramler, Catholic University of America; Prieth Faitoute Benedict, University of Virginia; Bernard Gunthel Murray, Georgetown University; William Pierce Goodwin, Howard University.

The Secretary announced that the following officers and councilors had been elected: President, Robert J. Moore; Vice-president, Joseph W. E. Harrisson; Secretary, Howard S. Neiman; Treasurer, Burke H. Knight; Councilors, William T. Read, Gustav Egloff, and Norman A. Shepard.

The next meeting of the Council was set for Thursday, June 2, 1938.

The following new members were elected:

FELLOWS

Henry S. Frank
(1938), *Associate Professor,* Lingnan University, Canton, China.

F. A. Gilfillan
(1938), *Associate Professor,* Oregon State College, School of Pharmacy, Corvallis, Oregon.

Paul Hamilton Horton
(1938), *Chemist,* Oklahoma Testing Laboratories, Oklahoma City, Okla.

William Howard Hunt
(1938), *Pharmacologist,* Maltbie Chemical Company, Newark, N. J.

L. F. Shackell
(1938), *Pharmacologist,* E. R. Squibb and Sons, New Brunswick, N. J.

There being no further business, adjournment was taken.

CHAPTERS

New York

Chairman, Frederick Kenney *Vice-chairman,* Frederick W. Zerban

Secretary-treasurer, D. H. Jackson
17 John Street
New York, N. Y.

Council Representative, W. D. Turner

Pennsylvania

Chairman, Gilbert E. Seil *Vice-chairman,* Walter L. Obold

Secretary-treasurer, Maurice L. Moore
Sharpe and Dohme, Inc.
P. O. Box 1404
Philadelphia, Penna.

Council Representative, Joseph W. E. Harrisson

Niagara

Chairman, Howard W. Post *Vice-chairman*, William R. Sheridan

Secretary-treasurer, Luther M. Lauer
98 North Buffalo Street
Orchard Park, N. Y.

News Reporter to THE CHEMIST, W. A. Smith
Council Representative, Arthur W. Burwell

A meeting of the Chapter was held on April first at the Park Hotel, Lockport, New York, with twenty members and visitors present. Wilbert A. Herrett, A.A.I.C. spoke on the life of Madame Curie. The recent publication, "Madame Curie", a biography by Eve Curie and translated by Vincent Sheean, was the basis of his talk.

It was shown that though the discovery of radium was in itself a great chemical achievement, the real greatness of Marie Curie was in her character. She was born into a poor family suffering at the hands of Russian oppression in Poland. In spite of seemingly unsurmountable odds, Marie Curie had through work, self-sacrifice, perseverance, and courage, coupled with an unusual mind, lifted herself to the heights of true greatness. Marie Curie's husband was Pierre Curie, a well-known physicist and chemist of high type, very spirited, conscientious, and ambitious in his research work. Marie and Pierre Curie devoted their lives to science. It was because of their combined efforts in research on radioactivity that radium chloride, and later radium itself, was prepared; giving to the world a new element that later was to be used to save human lives in the fight against cancer. Marie Curie was the recipient of sixteen medals, two Nobel prizes, and over one hundred honorary titles from various universities and scientific societies.

Dr. J. Frederic Walker traced the history of chemistry from Albertus Magnus in 1200, who wrote practically the first book on chemistry, to the time when specialization began with Ostwald in about 1850, stressing particularly the many-sided interests of the men who were responsible for major developments. Albertus Magnus translated the language of the alchemist to that of the chemist, recognizing the difference between the alchemists' gold and real gold. He was a bishop and later a saint.

Agricola studied medicine and was the first mining engineer. He was the burgomeister of chemistry. Leonardo de Vinci tried to make an aeroplane. Robert Boyle was a missionary. Priestly was a liberal thinking preacher, and Lavoisier was an amateur dramatist. Humphrey Davy was a poet, an amateur artist and an apothecary; and Dalton was an elementary school teacher.

Dr. Walker spoke of the phenomenal success of Albertus Magnus as a teacher, and of Paracelsus and the later teachers who learned from the artisans rather than from the orthodox classics. He called attention to the difficulties of publication, citing Rabelais, who found it necessary to publish his works as a series of funny stories in order to avoid persecution. Dr. Walker has a

keen insight in the humanitarian aspects of chemistry and treated his hearers to phases of the subject very rarely heard.

Dr. George M. Bramann, F.A.I.C., talked on Antoine L. Lavoisier, who led chemistry a great stride forward, although his work was not in the discovery of new elements or properties. His first contribution to science was the destruction of the belief that water was the basis of all matter. By constant distillation and weighings he showed that all solids which resulted came from the flasks. The greatest contribution to science made by Lavoisier was his explanation of combustion. The first step toward a satisfactory solution was his discovery that phosphorus and sulfur gained weight when heated. His final step was to heat mercury in a closed chamber, and then to liberate the oxygen from the mercury. His experiments showed that combustion was the union of the burning substance with oxygen. His untimely death brought to a close a life of versatility in an unbelievable number of fields.

Washington

Honorary President, Charles E. Munroe
President, Louis N. Markwood
Vice-President, Norris W. Matthews
Treasurer, James B. Martin
Secretary, A. P. Bradshaw
2121 New York Avenue, Washington, D. C.

News Reporter to THE CHEMIST, James F. Couch
Council Representative, Louis N. Markwood

BOOKS

PROGRES REALISES DANS L'APPLICATION DES MATIERES COLORANTES. By L. Diserens. (280 pages. Price, $3.50.)

Due to the rapid advances in the chemistry of dyes and compounds auxiliary to dyeing methods, the average book upon these subjects is soon antedated, and it is the object of this publication to bring these subjects up to date by augmenting the former publications through a description of the latest developments. The publication covers completely the field of latest inventions in dyestuffs both as to their properties and methods of dyeing and also contains a most valuable table of the latest dyeing auxiliaries whether they are used as mordants or as means for facilitating the dyeing processes. This table includes the nature of the compound, its manufacture, constitution, means of preparation and methods of application.

The book also includes a description of all of the recent German patents relating to these subjects with cross references to patents in other countries. This publication is an indispensable complement to those previously published and a copy should be in the hands of everyone interested in the dyeing industry. This publication is to appear in two volumes, Volume I having now been issued.

THE CHEMICAL ANALYSIS OF FOODS AND FOOD PRODUCTS. By Morris B. Jacobs. Price $6.00.

This book is intended to be a more or less exhaustive coverage of every feature involved in the inspection and chemical control of the composition of food products. It includes directions for such simple matters as the sampling of shipments and the determination of the net contents of containers, and ranges up to a discussion of vitamins with an indication of their chemical determination.

As a worker of long standing in the field of food analysis, the author has, on the one hand, developed or discovered from his reading many minor devices of technique and procedure which facilitate work. On the other hand, he has, during the same time interval, acquired strong and original points of view which differ considerably from those generally accepted. These, however, are usually of interest and, except for the traditional inertia of such large bodies as the Association of Official Agricultural Chemists, would doubtless have received some consideration by them.

The book is deliberately broad in its scope, since it is designed both as a text book for students and as a standard reference for food analysts. In pursuance of the first objective, it illustrates and explains the use of the pyknometer and devotes a few pages to the mathematical treatment of the photoelectric colorimeter.

In pursuance of the second objective, it contains thirteen chapters devoted to the analysis of different classifications of food stuffs and four chapters on general methods applicable to any kind of material. Each of the chapters on varieties of food stuff contains some discussion of the interpretation of results, although this important material is not handled in any systematic manner nor is it always based on the most recent of published standards.

There are a few evidences of hasty and careless composition. On page 100, for instance, the directions for the determination of carotene are marred by an instruction to wash a water extract "twice gently with water". The standards of color strength against which the carotene is to be measured are indicated only by journal references.

The book is well documented both with references for student reading and more specific references to the journal articles from which material has been obtained. On the whole, by judicious selection of material, it can well form a basis for an excellent course in food analysis and, thereafter, will be exceedingly useful as a reference in the library of every food analyst on more recent material than is to be found in the "Official Methods".

—KARL M. HERSTEIN, F.A.I.C.

LABORATORY TECHNIQUE IN ORGANIC CHEMISTRY. By Avery Adrian Morton. $2.50.

This little volume was devised by Professor Morton "to improve the student's understanding of ordinary laboratory manipulations and to widen the research worker's knowledge of the apparatus at his command." These two objects it fulfills admirably.

There are eleven chapters on the following topics: Drying and Drying Agents, The Melting Point, The Boiling Point, Fractional Distillation, Vacuum Distillation, Steam Distillation, Crystallization, Filtration, Adsorption, Extraction, and Special Methods and Apparatus.

Each chapter contains a general discussion of the principles involved, a considerable number of alternative procedures, and ends with a bibliography of substantial length. Used in connection with an advanced course in organic laboratory work, therefore, it will give the student an excellent theoretical knowledge of the principles involved in the techniques which he has to employ.

The reviewer feels that it will serve an even better purpose as a reference for research workers in organic chemistry.

It is regrettable that no chapter on glass blowing technique was included. This could very well have taken the place of the final section of the book which contains experiments illustrative of the various types of procedure involved; although the specific illustrations of microtechnique and manipulation, not being included in such works as Gatterman, are possibly valuable.

On account of its exhaustive treatment as well as its thorough documentation, the book is an absolute *must* for the library of every worker in synthetic organic chemistry.

—Karl M. Herstein, F.A.I.C.

Polymerization, No. 75 of the American Chemical Society Monograph Series. By Robert E. Burk, Howard E. Thompson, Archie J. Weith, F.A.I.C., and Ira Williams. $7.50.

Polymerization, a branch of chemistry so important in the modern chemical world, has lacked heretofore a comprehensive reference work such as is this book. Although the authors have not intended to delve into all of the applied fields of polymerization, they call attention to the need for more information in those fields they have omitted. The first four chapters of one hundred and sixty pages cover the relation between molecular structure and the rate of polymerization, the mechanisms of polymerization, catalysis and polymerization, and the liquid state and structure of polymers. The chapter on catalysis has an exhaustive table of fifty-eight pages giving the catalysts, substances polymerized, the products and remarks, and the original reference; and to facilitate its use the table is cross indexed. The last three chapters of one hundred and ten pages treat polymerization in the rubber, synthetic resin, and petroleum industries, since most of the theoretical and research work has been done along these lines. The book contains a wealth of well organized material, aptly cross-indexed and referenced; and is profusely supplemented with graphs, tables, structural formulae, and over one thousand seven hundred references to original works and patents.

—C. F.

Organic Chemistry, Howard J. Lucas, Associate Professor of Organic Chemistry, California Institute of Technology. 685 pp. Many formulas and tables. Price $3.50.

The making of books upon chemistry seems to be an inherent attribute of every chemist, but occasionally some one evolves a book based upon new principles and formulated in such a manner as to present the intricacies of chemistry in a form readily understandable. That is the case with the author of the publication under consideration, who has presented the subject matter in a systematic and logical

manner while correlating the principles of chemistry. The author has emphasized class reactions rather than the reactions of individual compounds and the relationship with inorganic compounds is also explained. Energy relationships are discussed and their significance pointed out; the underlying principles of molecular structure are presented and applied to individual cases throughout the book. The electrochemical nature of radicals is indicated and their effect upon properties noted.

It has been the endeavor of the author to present the reactions of chemicals, their properties and their relation to each other in a logical and clearly understandable manner, and hence the book represents one of the most valuable books of reference upon this subject. A copy of this publication should be in the library of every chemist, and especially in that of those interested in organic chemistry, because of its scope and its method of treatment of the properties and underlying theory of chemical reactions.

Newer Methods of Volumetric Analysis. A compilation of various authors. Wilhelm Bottger, editor. Ralph E. Oesper, translator. $3.75.

This monograph contains seven sections, three by one author and the balance each by a different author; and includes a discussion of Titration Errors in Acid- or Alkalimetry, Ceric Sulfate, Alkaline Permanganate, Iodate and Bromate Methods, Chromous Solutions, Oxidation-Reduction Indicators, and Adsorption Indicators.

Each section represents an excellent statement of our present knowledge in the special field, and is accompanied by a voluminous bibliography.

As a whole, the volume is an excellent contribution to analytical chemistry as a science. It should undoubtedly be of considerable interest to postgraduate students of analytical chemistry, whether still in residence at a university or practicing their profession.

—Karl M. Herstein, F.A.I.C.

CHEMISTS

Dr. Elmer O. Kraemer, F.A.I.C., formerly professor of colloid chemistry at the University of Wisconsin, and for the last ten years in charge of fundamental research in colloids at the Experimental Station of the E. I. du Pont de Nemours & Company, Inc., has resigned in order to accept a Fellowship of the Lalor Foundation. Dr. Kraemer will spend a year in the laboratories of Professor The Svedberg, and will travel extensively to survey graduate research and instruction in European universities.

The American Section of the Society of Chemical Industry announces the election of the following officers for the year 1938-39. Chairman, Wallace P. Cohoe; Vice Chairman, Lincoln T. Work; Honorary Secretary, Cyril S. Kimball; and Honorary Treasurer, J. W. H. Randall, F.A.I.C.

The following new Committee members were elected to take the place of retiring members: James G. Vail, F.A.I.C.; R. L. Murray; A. E. Marshall; N. A. Shepard, F.A.I.C. and D. P. Morgan, F.A.I.C.

Harvey G. Kittredge, F.A.I.C., has recently been granted a patent on a new rubber substitute made from tung, soya, and other oils.

Dr. J. Willard Hershey, F.A.I.C., head of the Chemistry Department at McPherson College, has been directing work since 1923 on the production of synthetic diamonds, this work being reviewed in a paper delivered before the American Chemical Society. The largest diamond produced thus far is one-thirtieth of a carat.

Concluding a research program begun in 1902, a process for producing standardized high-grade coal from virtually any grade of material from run-of-mine coal to refuse, was announced recently by the E. I. du Pont de Nemours & Company, R. & H. Chemicals Department, Minerals Separation Division. The process is known as the Sink-and-Float process, after the physical principle upon which it is based.

Walter A. Wisansky, having completed all the requirements for his Ph.D. Degree at Columbia University, has joined, as a research assistant, the staff of the Herstein Laboratories, Inc., 18 East 41st Street, New York City, of which Karl M. Herstein, F.A.I.C., is president.

We have received the following inquiry and we would be pleased to receive assistance in answering it:

"Dear Sirs:

Do you know of a radio-advertized soap that is strong enough to deodorize its own publicity?"

Alexander Silverman, F.A.I.C., head of the Department of Chemistry in the University of Pittsburgh, as one of the United States delegates, delivered an address at the International Congress of Chemistry, held last month in Rome, Italy, on "Some Recent Developments in American Glass Manufacture."

The Fifteenth Biennial Conclave of Alpha Chi Sigma, Professional Chemical Fraternity, will be held at the Hotel Jung, New Orleans, June twenty-first to twenty-fifth. The honor initiate at the model initiation ceremony will be Dr. Harry B. Weiser, F.A.I.C., professor of chemistry and dean of Rice Institute, Houston, Texas.

Edward Thomas, attorney-at-law, and author of several articles in THE CHEMIST, will give one of the courses, which will include some chemical patent law, in the "summer school of law" to be held at the Hotel Astor, New York, N. Y., July fifth to fifteenth. These practicing law courses are open to practicing lawyers or others interested. Information may be obtained from Mr. H. P. Seligson, 50 Broadway, New York, N. Y.

Foster D. Snell, Inc. held its annual dinner on April twenty-first at the Brooklyn Club, with 26 members of the organization present. Dr. Foster Dee Snell, F.A.I.C., introduced the guest speaker, Mr. Elmer A. Sperry, Jr., vice-president of Sperry Products, Inc. and of the Sperry Development Corporation.

Mr. Sperry spoke on the various applications of the gyroscope, illustrating his talk with three sets of moving pictures and slides.

NORTHERN LIGHTS

By Howard W. Post, F.A.I.C.

Some time ago it was said that Sir Frederick Banting, the discoverer of insulin and present director of the Department of Medical Research of the University of Toronto, had disposed of all his rights to the discovery of insulin for the sum of one dollar and had never received even that amount. So it was with considerable interest that we read an article in *Canadian Chemistry and Process Industries* **22** 168 (1938) to the effect that the National Research Council of Canada has decided to study the situation in which medical research finds itself today in the Dominion. Further reading of this article suggested many points which have been matters of common thought for some time.

In the first place, we understand fully Dr. Banting's situation with respect to remuneration. But it does seem that some system should be devised whereby such talent and achievement could be rewarded to a slightly greater extent than by the symbolic payment of one dollar. Perhaps the investigating committee intends to work out such a system which will do justice without violating any portion of the scientific code. Then again we have long noted the fact in medical science as in chemistry that there are many men, trained as well as our modern colleges can train them who are in general practice or industrial work but who would give everything they have for a chance to get into research. They have the ability, too. But how can a man go into research under the modern set-up and still make enough to support a family? Surely we can but continue our efforts toward the further subsidizing of workers in pure science whether medical or strictly chemical.

From across the line comes the hope that perhaps this investigation will result in the setting up of a medical research council similar to the organization now functioning in Great Britain. It is stated that there will be no opposition from the National Research Council of Canada if such be the plan.

However, the immediate objectives, to quote the article directly are "1. to receive suggestions for requirements in respect of medical research and in matters related thereto; 2. to consider by whom the investigations required can best be carried out and to make proposals accordingly; 3. to correlate the information when secured and to make it available to those concerned, and 4. to do such other things as the committee may deem advisable to promote medical research in Canada."

"Business is putting a few more windows in its mind, so that people can see out and see in; and that is why quite rational thinkers on this question urge seriously that billion-dollar corporations elect one or two struggling farmers to their Boards and listen seriously to their simple words of wisdom, as persons." When speaking of outsiders on boards of directors, why omit chemists and engineers?

CHEMISTS ABROAD

By James N. Taylor, F.A.I.C.

"CHEMISTS in the Public Services" or as properly titled, "Official Chemical Appointments" has reached its ninth edition. It is published by The Institute of Chemistry, 30, Russell Square, London W.C.1. Pages 352, plus name and place indices. Price to non-members of the Institute, 5s.

Intended primarily for the use of professional chemists, this publication, the first edition of which appeared in 1906, should be found of considerably wider utility. Its contents are arranged in the following main divisions: (1) A list of appointments in Great Britain, in Northern Ireland, and the Irish Free State, in the various government departments, County and Borough Councils and other Authorities, in connection with public utility service, and in universities, colleges, technological institutions, medical, agricultural and veterinary colleges, and in public and secondary schools. (2) A similar list of appointments in the Empire of India, in the Dominions overseas, in the British Colonies and Protectorates, and also in Egypt and the Sudan Provinces. (3) A list giving concise information regarding societies and institutions for the advancement of chemical science, and of professional and other chemical interests. (4) Statutes, Orders, etc., affecting official chemical appointments; and (5) Further information regarding appointments overseas. In addition to strictly chemical appointments, mention is made of many positions connected with agriculture, metallurgy, assaying, bacteriology and other branches of work in which chemical knowledge and skill are necessary and useful; whilst particulars are given of Acts of Parliament and regulations under which the appointments are made. The new edition has been completely revised and enlarged.

—*Chemical Trade Journal, London.*

THIRTY-FOUR nations represented by 2,800 chemists among which were several Nobel Prize winners participated in the International Chemical Congress which opened last month in Rome, according to a report to the Department of Commerce by the office of the American Commercial Attaché at Rome. American delegates to the Congress numbering thirty-two were headed by C. C. Concannon, F.A.I.C., chairman of the American Delegation and Chief of the Commerce Department's Chemical Division.

Germany with seven hundred delegates from various academies and industrial laboratories was represented by the largest number of delegates. German chemists were scheduled to lecture on synthetic motor fuels, artificial lubricants, synthetic tanning materials, new varieties of paraffin, synthetic albumin, and topics in the field of biological chemistry, as well as several other important developments that have taken place during the four years which have elapsed since the last Congress.

The Congress was opened in the presence of the King of Italy, and the welcoming address was made by the Governor of Rome, who pointed out that this was the second time in thirty-two years that Rome had been hostess to the International Congress.

MR. ERNEST BROWN, the British Minister of Labour, recently gave in the House of Commons the following information of the numbers of insured men and women and of the unemployed in the chemical group, which includes chemicals, explosives, paints, oils, etc. and in the chemical industry proper.

Men and women, ages 18-64

	Estimated numbers insured Men and women, ages 18-64 Chemical group	Chemical industry
July, 1937	211,170	99,640
July, 1936	203,050	96,540
	Insured unemployed:	
January, 1937	15,195	7,784
January, 1938	14,679	7,316

Of these employed, about one-third are women. *Chemistry and Industry, (London.)*

THE new School of Metallurgy and Mining, Melbourne Technical College, is being erected and will be ready for occupation in June, 1938, states *Chemical Engineering and Mining Review (Melbourne)*. From a perspective sketch the new building appears to be of modernistic, streamlined proportions. It occupies frontage of ninety-five feet with a depth of eighty-five feet and a height of fifty feet, and will be the most up-to-date school of its kind in Australia. The number of students enrolled for mining and metallurgical courses is approximately forty, while instruction in metallurgical subjects is given to about five hundred.

"MR. and Mrs. Ray Gordon, of Denver, Colorado, have just been fined five dollars each for intoxication, on the evidence of the 'Drunkometer,' the invention of Dr. Rollo H. Hargas, State toxicologist. The apparatus includes a balloon into which the 'patient' breathes. Its contents are then chemically tested with a solution of permanganate of potash." — Recent News Paragraph.

Though Isaac Newt. was wise and cute,
And Bunsen's burning brain astute,
And none can say that Faraday
Was not a wonder in his way;
Yet we preserve our loudest cheers
For scientists of later years.

The volt and amp., the safety lamp,
And laws of motion, for examp.,
Have done the world a world of good
(As all these great inventions should);
But not till now have we been blessed
With one good, simple "drunken" test.

We order jail for all who fail
At tricks that pliant tongues entail;
And woe betide the bleary-eyed
And those that roll from side to side;
While scores are carted off to clink
Because of what our nostrils think.

Such tests as these now fail to please,
And rouse the wrath of M.Sc.'s;
Whose wider knowl., acquired at coll.,
Enables them to see the foll.
Of thinking that there's any sense
In deportmental evidence.

The modern meth. (so Science saith)
Investigates the suspect's breath.
He expirates, and thus inflates
With alcoholic concentrates
A toy balloon: whose contents we
Dissolve in water (10 c.c.).

To fix his fate, we now titrate
Acidified permanganate;
When, with a sheer excess of beer,
The purple tint will disappear.
A scientific straw that shows
Which way the wind of progress blows.

—A. H. GRAY.

—*The Chemical Trade Journal (London)*

EMPLOYMENT

Positions Offered

BIOCHEMIST WANTED. Ph.D. Two to four years experience along lines of animal nutrition, physiology of humans and animals, vitamin research, plant physiology, sales personality good appearance, able to contact doctors, dieticians, hospitals, and be able to do laboratory work in food preservation. Near New York. Salary $3,000. Please write Box 55, THE CHEMIST.

CHEMIST WANTED with three to five years experience in synthetic resins, phenol-formaldehyde type. Locate New England. Salary Open. Please reply to Box 53, THE CHEMIST.

CHEMIST WANTED. Four or five years experience in paint formulation and pigment testing. Laboratory in South. Preferred age 35. Salary open. Please reply to Box 51, THE CHEMIST.

WOMAN CHEMIST WANTED. College graduate not over thirty. Good background in home economics to work in research laboratory in connection with sales and advertising. Must know baking and food designing or concocting. Pleasing personality and able to give lectures and demonstrations to women's groups. Salary open.

Chemists Available

ORGANIC CHEMIST, F.A.I.C., Ph.D., six years industrial experience synthesizing dyestuffs and intermediates. Laboratory, full scale and semi-plant developments. Teaching experience. Please reply to Box 44, THE CHEMIST.

Position wanted by F.A.I.C. Age 29, B.Sc. degree. Experienced as technical director and research chemist in fields of electro-chemistry, ultra-violet light, food chemistry, spectroscopy, minerals, plants, biochemistry, and fermentation. Has designed and equipped laboratory. Please reply to Box 56, THE CHEMIST.

Teaching Position wanted by F.A.I.C. in East or Northern United States. Ph.D. with ten years of college teaching involving general chemistry, qualitative and quantitative analysis, organic chemistry, technical chemical analysis, electro and metallurgical analysis, and physical chemistry. Can assume full charge of laboratory or chemistry department. Considerable industrial, expert and consulting experience. Please reply to Box 52, THE CHEMIST.

Position wanted by F.A.I.C. Age twenty-five, married. B.S. in chemical engineering, Pennsylvania State College, 1933. Graduate study in rare elements. Experienced in general inorganic analysis, specifically in ferrous metals and refractories. Some experience in insecticides. Willing to go anywhere for a living wage. Please reply to Box 54, THE CHEMIST.

CHEMICAL ENGINEER, F.A.I.C., age 33 with ten years' experience for work in production or in the development of semi-work and full scale plants from research data in the chemical or allied processing industries. Can assume full charge of work in medium sized plants. Experience in fields of fine chemicals, utilization of wastes, and gaseous syntheses operations. Please reply to Box 42, THE CHEMIST.